H. W. DAY.

METHOD OF AND APPARATUS FOR APPLYING COATING.

APPLICATION FILED SEPT. 8, 1919.

1,321,014.

Patented Nov. 4, 1919.

2 SHEETS—SHEET 1.

Fig. 1.

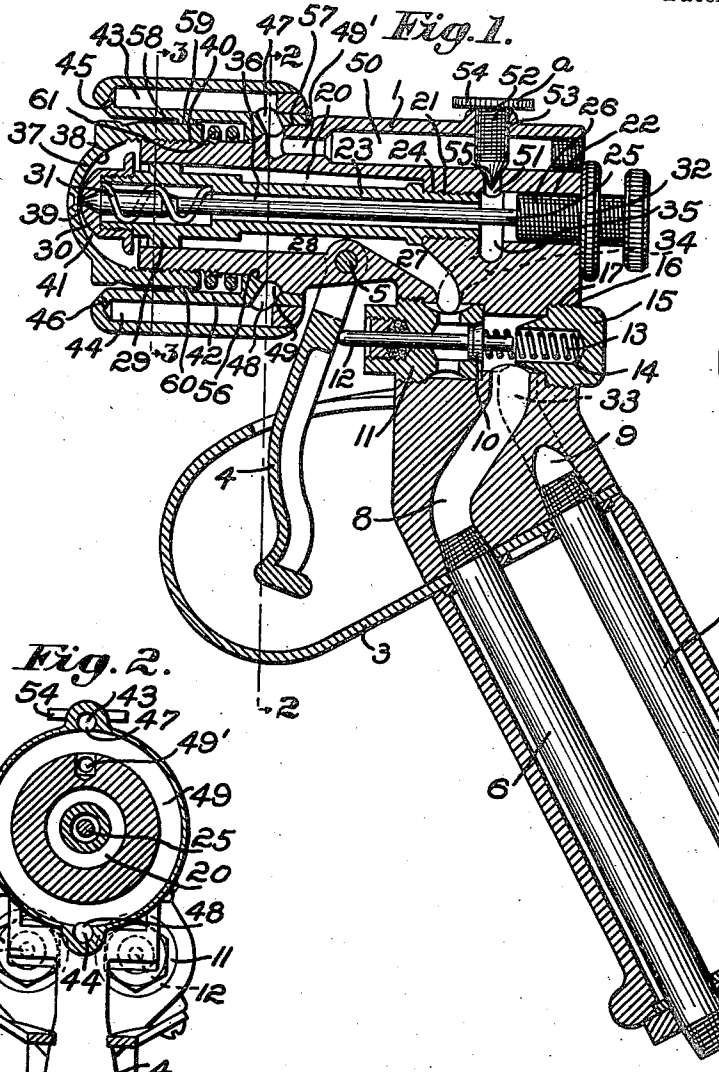


Fig. 3.

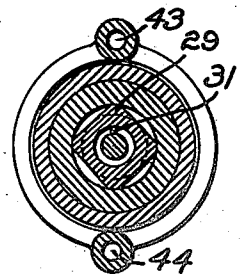


Fig. 2.

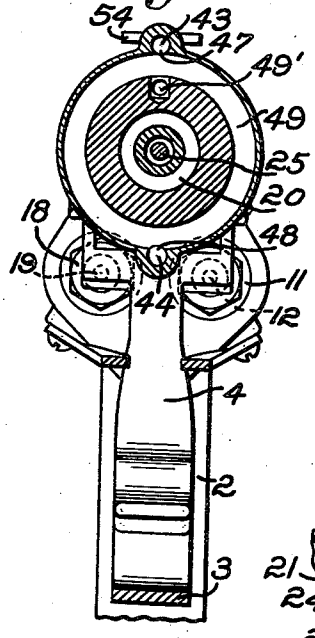


Fig. 4.

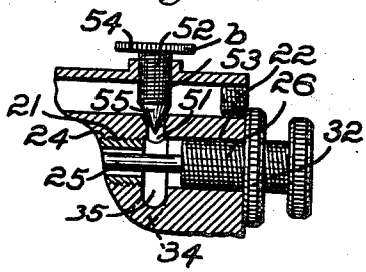
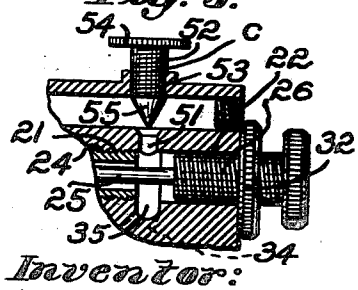


Fig. 5.



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2 SHEETS—SHEET 2.

Fig. 6.

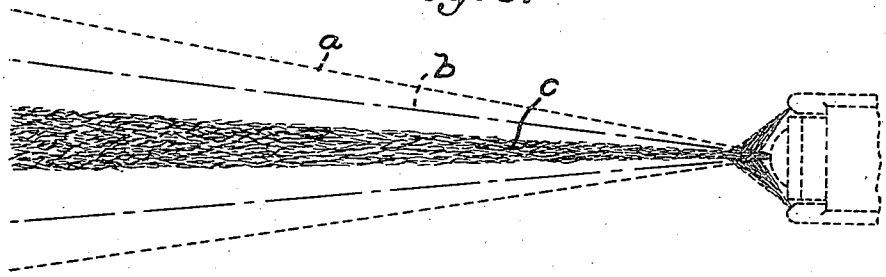


Fig. 7.

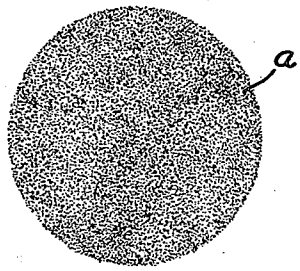


Fig. 8.

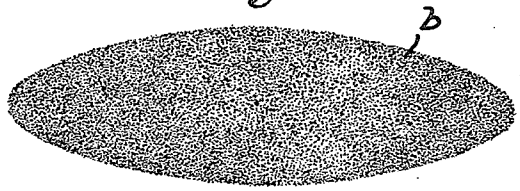


Fig. 9.



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UNITED STATES PATENT OFFICE.

HERBERT W. DAY, OF WOLLASTON, MASSACHUSETTS, ASSIGNOR TO SPRAY ENGINEERING COMPANY, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

METHOD OF AND APPARATUS FOR APPLYING COATING.

1,321,014. Specification of Letters Patent. Patented Nov. 4, 1919.

Application filed September 8, 1919. Serial No. 322,539.

To all whom it may concern:

Be it known that I, HERBERT W. DAY, a citizen of the United States, and a resident of Wollaston, in the county of Norfolk and State of Massachusetts, have invented an Improvement in Methods of and Apparatus for Applying Coating, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention relates to the method of and apparatus for applying coating to surfaces, and so far as the apparatus is concerned is an improvement upon the construction shown in my co-pending application Serial No. 309,692, filed July 9, 1919.

The coating, if a liquid, may be a paint, japan, varnish or any other suitable coating medium, or it may if desired be a solid in powdered form, and the material or surface to which it is to be applied may be of any character, such, for example, as wood, metal or other material.

An important object of my invention is to provide an industrial tool or appliance which may be used not only in rough work not requiring a great nicety of manufacture or costly and delicate parts, but which may be used satisfactorily in fine or high grade work. Other objects of the invention will be set forth hereinafter.

Referring more particularly to the drawings wherein I have represented a single embodiment of my invention,—

Figure 1 is a vertical longitudinal section of a tool constructed in accordance with my invention;

Fig. 2 is a vertical transverse section on the line 2—2 of Fig. 1 and looking toward the right in said figure;

Fig. 3 is a similar view upon the line 3—3 of Fig. 1 and looking toward the right in said figure;

Figs. 4 and 5 are details in vertical section and representing different positions of the valve governing the flow of the supplemental air jets;

Fig. 6 is a diagrammatic representation of different characters of discharge from the tool consequent upon different positions of the valve governing the flow of the supplemental air jets;

Figs. 7, 8 and 9 are diagrammatic representations corresponding to transverse sections through the discharge from the tool, consequent upon different positions of the valve governing the supplemental air jets.

The tool or appliance may be of any suitable material but is preferably metallic and may be of the general form shown in my Patent No. 1,172,233, dated February 15, 1916, or of any other suitable form or construction. The body 1 is, however, preferably provided with a handle or extension 2 integral therewith and provided with a guard 3 inclosing the free end of the valve operating lever 4 pivoted at 5 upon the body 1. In the disclosed form of the invention, the said operating lever 4 is of general trigger form, but such construction may be widely varied within the scope and purpose of the invention.

The handle 2 is provided with a passage 6 for the paint or other suitable coating liquid or powder, which may be supplied through gravity or under suitable pressure if desired and also with a passage 7 for the air or other suitable fluid under pressure. In the form of tool herein shown, I have represented the passages 6, 7 as pipes suitably secured in the body 1 and as communicating at their inner ends with passages 8, 9 cored or otherwise suitably provided in the body 1. Controlling the paint supply passage 8 is a valve which may be of any suitable form, but which is herein represented as an axially movable piston or plunger 10 positioned within a valve casing 11 and having a stem 12 extending through the valve casing into contact with the operating lever 4, as clearly shown in Fig. 1. The valve here shown as a piston or plunger is normally held seated by a coiled spring 13 surrounding the stem 12 and seated in a recess 14 in a cap 15 threaded at 16 into the body 1 similarly threaded at 17.

The passage 9 for the air is controlled by a similar valve indicated generally at 18 in Fig. 2, the spindle 19 thereof contacting with the valve operating lever 4 which is shaped so as to engage both valves in a manner herein unnecessary more fully to illustrate.

The body 1 is cored to provide a longitudinal passage 20 which is internally threaded at 21, 22 for the reception respectively of a tubular member 23 threaded at 24 and a needle valve 25 threaded at 26. The tubular member 23 at its forward end is

preferably suitably formed to permit the passage of the coating material issuing from the valve chamber 10 into the passage 27 and thence into the circumferential space 28. For this purpose, the forward end of the tubular member 20 is preferably squared at 29, as indicated most clearly in Fig. 3. Thus the coating material, when the valve 10 is opened, is permitted to flow through the passage 6, the valve casing 11, the passages 27, 28, and thence past the squared formation 29. Upon the forward end of the tubular member 20 is threaded or otherwise positioned a cap 30, which may if desired be similar to the corresponding member in my Patent No. 1,172,233. The needle valve 25 is seated at its outer end in the cap 30 as indicated in Fig. 1, and the forward end of the said needle valve is guided and positioned by any suitable means, as, for example, by a coiled wire 31 encircling the head of the valve and maintaining it in a central position when the valve is unseated. The rear end of the valve 25 may be provided with a suitable lock nut 32.

The air passage 9 is in communication with a passage 33 indicated in dotted lines in Fig. 1, which is itself in communication with the valve chamber containing the valve 18 and extending from such valve chamber is an air passage 34 indicated in dotted lines in Fig. 1 and communicating with a passage 35 forming an enlargement of the passage 36 of the tubular member 20. When the valve 18 is opened, the air flows through the passages 33 past the valve 19 through the passages 34, 35 and into the passage 36 governed or controlled by the needle valve 25.

Upon the outer end of the body 1 is threaded or otherwise suitably secured a preferably cap like member 37 herein shown as having a concaved or curved inner surface 38 and a small central opening 39 in line with the axis of the needle valve 25. The length of the threaded portion 40 of the cap-like member 37 is sufficient to permit adjustment of the member 37 so as to provide for the effective formation of a film and the variation of the thickness thereof as described in my Patent No. 1,172,233. Such film is constantly formed and maintained by capillary action between the surface 38 and the outer surface 41 of the inner cap 30 which are brought close enough together to insure such action. The air entering through the passage 36 breaks through the film at the central portion of the cap and discharges the same upon the work in very fine globules. Said film is constantly broken by the air or other fluid but is constantly restored through the action of capillarity. Hence the coating material may be merely under suction due to capillary action. The maintenance of the supply of coating material is not dependent upon the presence of the air space which is used merely to break the film and discharge the globules. I effect through the described construction a very fine division of the coating material as set forth in my said Patent No. 1,172,233.

The construction of parts thus far described effects the formation of a mass of spray of general conical form issuing through the orifice 39, but generally circular in cross section, as indicated at *a* in Fig. 7. This result is effected by the disruption of the film formed between the cap like members 30, 37 through the agency of the air or other suitable fluid in the manner already described.

I am aware that it has been proposed to modify the character of the spray issuing from a tool or appliance for applying coating by means of supplemental jets of air directed upon the discharged spray, as shown, for example, in the patent to Burdick, No. 649,430, dated May 15, 1900, and also in the patent to De Vilbiss and Mueller, No. 1,260,522, dated March 26, 1918. In accordance with both of these patents, the shape of the spray discharge is changed from a circular form into that of a thin sheet through the use of supplemental air jets directed upon the spray issuing from the discharge end of the tool or like appliance.

In my co-pending application Serial No. 309,692, I have provided means for discharging supplemental air jets upon the discharged film of paint or other coating material in such a manner as to change or transform the issuing spray from a conical formation circular in cross section into a sheet. My present invention constitutes a marked advance in the art in that among other features I have provided means whereby a mass of spray as discharged may be given any form between that of a relatively thin sheet and a cone or mass circular in cross section.

In Fig. 7 at *a* I have diagrammatically indicated the cross sectional shape of a spray discharge unmodified by supplemental air jets. In Fig. 9, at *c* I have indicated diagrammatically the approximate or general form of a spray discharge as modified by the full effect of supplemental air jets which transform the spray discharge into a relatively thin sheet. At *b* in Fig. 8 I have indicated one of the intermediate forms into which the spray mass may be changed or transformed through the action of weaker supplemental air jets, the spray mass being herein indicated as of approximately elliptical form in cross section. So far as I am aware, it has never heretofore been proposed to provide other than the full conical spray or the flattened or sheet like spray shown respectively in Figs. 7 and 9.

Not only am I enabled by my invention to provide intermediate forms of spray masses by which the application of the coating may be greatly facilitated, or whereby the coating may be applied to objects of peculiar form or having parts which may be difficult to reach, but I am enabled to break up the coating material into globules or particles of any desired fineness. The paint or other material is broken up by the air issuing past the needle valve 25 to a certain degree of fineness, but it is frequently desirable to break up the coating material to greater degrees of fineness. By providing supplemental air jets under full force or pressure, I am enabled to break up the coating material into particles or globules of the most extreme fineness. By modulating or varying the pressure of the supplemental air jets, I am enabled to obtain any desired intermediate degree of fineness of the coating particles.

In carrying out my invention I provide a generally cylindrical member 42 having any suitable number and herein two tubular extensions 43, 44, preferably diametrically opposed to each other and terminating in discharge passages 45, 46 inclined toward each other, and clearly represented in Fig. 1. The two supplemental air passages 43, 44 are respectively in constant communication at their inner ends through passages 47, 48 with an annular passage or groove 49 shown as formed in the outer surface of the forward end of the body 1 and communicating through the longitudinally extending passage 49′ with a passage 50 in the body member 1, and which is in communication with the main air passage 35 through a small port 51. This port is controlled by a valve 52 threaded into an opening 53 of the body 1 and having a preferably knurled head 54 by which it may be readily turned manually. The inner tapered end 55 of said valve is adapted to be seated so as to close the port 51 or to be opened fully or to any desired extent, thus regulating the air supply through the passage 50. This valve is in effect a reducing valve whereby the supplemental air pressure can be regulated, and whereby any desired degree of fineness of the discharged coating material may be obtained. The annular groove 49 may if desired be formed in the inner surface of the member 42.

In order effectively to seat and control the position of the cylindrical member 42, I have herein provided the body 1 with a spherical surface 56 upon which is received the correspondingly shaped inner surface 57 of the cylindrical member 42. Coöperating with the spherical seat is the guiding surface 58 of the cap-like member 37. With such guiding surface 58 contact the projections 59, 60 extending from the walls of the supplemental air supply passages 43, 44.

I thus provide a spherical seat for the member 42, and in order truly to position the cylindrical member 42 upon such spherical seat, I provide the coöperating guiding surfaces 58, 59, 60, so that the supplemental air jets issuing from the passages 45, 46 will tend to intersect along the line of the axis of the coating discharged from the discharge opening 39.

Coöperating to hold the cylindrical member 42 in position, I provide a coiled spring 61 between the inner end of the cap-like member 37 and the cylindrical member 42.

I have stated that the outer surface of the body member 1 is provided with an annular passage or groove 49. Thus, the supplemental air passages 47, 48 are in constant communication with said annular groove or passage 49 whatever be the circumferential position of the cylindrical member 42. I do not interrupt or cut off the discharge of the supplemental air jets by movement of the cylindrical member 42, but do this wholly through the manipulation of the valve 52. By reason of this construction, I effect certain important results. It is frequently desirable to set the cylindrical member 42 at a certain circumferential position so as to secure a certain plane of the sheet of coating material and to maintain such plane thereof. This I am enabled to do, since the cutting off of the flow of the supplemental air jets is effected wholly through the manipulation of the valve 52.

In accordance with my method, I have provided for the formation of a coating discharge which may partake of any shape between that of a mass cylindrical in cross section and that of a mass of general sheet form, and furthermore I effect the discharge and application of the coating material in globules or particles of any desired degree of fineness.

In Fig. 6, I have diagrammatically indicated several forms assumed by the mass of coating material discharged from the tool or apparatus. By the dotted line *a*, I have indicated a conical mass which in cross section is substantially circular as indicated in Fig. 7. The discharged mass assumes this form when the supplemental air jets are not discharged through the passages 43, 44, that is, when the valve 52 is closed.

At *b* in Figs. 6 and 8, I have indicated the form of the discharged mass when supplemental jets of air of reduced pressure are supplied, the shape of such mass in cross section being intermediate between the circular cross sectional form shown in Fig. 7 at *a* and the sheet-like form in cross section shown in Fig. 9 at *c*. The form of such mass will depend upon the air pressure and

may therefore approach more nearly the circular form shown at *a* or the flat, sheetlike form shown at *c*. At *c* in Fig. 6, I have indicated the sheet-like form resulting from the discharge of supplemental air jets of full pressure upon the discharged coating material.

My invention in its broadest application is not limited to the formation of a film of the coating material, since such coating material may be positioned with respect to the discharging motive fluid in any suitable manner. Preferably, however, I provide for forming, breaking through and discharging a film.

Having thus described one illustrative embodiment of my invention and the method of practising the same, I desire it to be understood that although specific terms are employed, they are used in a general and descriptive sense, and not for purposes of limitation, the scope of the invention being set forth in the following claims.

Claims:

1. Means for applying coating comprising means for maintaining a film of coating material, means for causing a motive agent to break through and discharge said film, and means to effect the transformation of the discharged film into a sheet for application as such to the surface to be coated or into a mass intermediate in cross section between that of a sheet and circular form.

2. Means for applying coating comprising means for maintaining a film of coating material, means for causing a motive agent to break through and discharge said film, means to discharge the motive agent supplementally upon the discharged film to transform the latter into a sheet, and means to vary the supplemental discharge of the motive agent while maintaining the same.

3. Means for applying coating comprising means to supply coating material, means to subject the same to the action of a motive agent, thereby effecting the discharge of the coating material, means to discharge a motive agent supplementally upon the discharged film, and means to regulate the pressure of the supplementally discharged motive agent, thereby to vary the form of the mass of discharged material and also the degree of fineness of the particles thereof.

4. Means for applying coating comprising means to supply coating material, means to supply air under pressure upon said coating material to effect the discharge thereof, means to direct a plurality of supplemental air jets upon the discharged material, and means to vary the pressure of the supplemental air jets without varying the pressure of the main air supply.

5. That method of applying coating comprising providing a film of coating material, discharging compressed air against said film, thereby disrupting the same and discharging it as a mass or cloud, supplementally discharging compressed air upon said mass or cloud and varying the effect of such supplementary discharged air by varying the pressure thereof.

6. That method of applying coating comprising providing a film of coating material, discharging compressed air against said film, thereby disrupting the same and discharging it as a mass or cloud, supplementally discharging compressed air upon said mass or cloud and varying the effect of such supplementally discharged air by varying the pressure thereof while maintaining unchanged the pressure of the main air supply.

7. That method of applying coating comprising supplying coating material, discharging compressed air against said coating material, thereby effecting the discharge thereof as a mass or cloud, discharging compressed air supplementally upon said mass or cloud and controlling the form of the mass or cloud through control of the supplementally discharged air.

8. That method of applying coating comprising providing a film of coating material, discharging compressed air against said film, thereby disrupting the same and discharging it as a mass or cloud, discharging a plurality of streams of compressed air supplementally upon said mass or cloud and varying the pressure of such supplemental streams, thereby varying the fineness of the particles of coating material and varying the shape of the mass or cloud at the point of application thereof to the surface to be coated.

9. Means for applying coating comprising means to supply coating material, means to effect the discharge thereof through the action of a motive agent whereby the coating material is discharged in a finely divided condition, means to effect the transformation of the discharged coating material into a sheet for application as such to the surface to be coated and means to regulate the effect of said transformation means so as to produce a form intermediate in cross section between that of a sheet and circular form into a mass intermediate in cross section between that of a sheet and circular form.

10. A tool for applying coating comprising a body having passages for coating material and for a motive agent under pressure, a member supported upon said body and having one or more supplemental motive-agent discharge passages in full and continuous communication with the motive agent supply passage and means to vary the supplemental discharge while maintaining said full and continuous communication with the motive agent supply passage.

11. A tool for applying coating comprising a body having passages for coating ma-

terial and for a motive agent under pressure, a member supported upon said body and having one or more supplemental motive-agent discharge passages in uninterrupted and continuous communication with the motive agent supply passage, and a valve distinct from said member to regulate the flow and pressure of the motive agent through said supplemental passage or passages.

12. A tool for applying coating comprising a body having passages for coating material and for a motive agent under pressure, a member supported upon said body and having one or more supplemental motive-agent discharge passages in uninterrupted and continuous communication with the motive agent supply passage, and means to cut off the supply of the motive agent through said supplemental passage or passages without changing the rotative position of said member upon said body.

13. A tool for applying coating comprising a body having passages for coating material and for a motive agent under pressure, a member supported upon said body and having one or more supplemental motive-agent discharge passages in uninterrupted and continuous communication with the motive agent supply passage, and a valve interposed between the source of motive agent supply and the supplemental air passages in said member.

14. Means for applying coating comprising a body having passages for the coating material and for air under pressure, said body having a substantially spherical seat, a member having an inner spherical surface received upon said seat, coacting guiding surfaces distinct from said spherical seat and surface and upon said body and member and coöperating to maintain said member truly upon said spherical seat, and means for supplying one or more supplemental jets of motive agent through said member.

15. Means for applying coating comprising a body 1 having passages for coating material and for air under pressure, said body having a spherical seat 56, a substantially cylindrical member 42 having a spherical inner surface 57 received upon said spherical seat, said member having guiding surfaces 59, 60 to coöperate with the body 1, and means to supply supplemental jets of motive agent through said member.

16. Means for applying coating comprising a body 1 having passages therethrough for coating material and for air under pressure, a member 42 carried upon said body 1 and having one or more passages therethrough for supplemental streams of compressed motive agent, means for establishing uninterrupted communication between such passage or passages and the main motive agent supply passage, and a valve 52 for controlling the flow of the supplemental streams of motive agent.

17. Means for applying coating comprising a body 1 having longitudinal passages therein for the coating material and for air under pressure, the outer surface of said body having an annular groove 49, a member 42 seated upon said body and having a plurality of supplemental motive fluid passages in continuous and uninterrupted communication with the annular groove 49, and means distinct from said member for cutting off the flow of motive fluid through said member whereby the circumferential position of said member upon the body 1 may remain the same during both the discharge of motive material through said member and during periods of non-discharge of the motive agent through said member.

18. Means for applying coating comprising means to supply coating material, means to effect the discharge thereof through the action of a motive agent whereby the coating material is discharged in a finely divided condition, means to discharge the motive agent supplementally upon the discharged coating material to transform the latter into a sheet, and means distinct from said last mentioned means to vary the supplemental discharge of the motive agent while maintaining the same.

19. That method of applying coating comprising providing coating material, discharging compressed motive fluid against said coating material thereby disrupting the same and discharging it as a mass or cloud, supplementally discharging compressed motive fluid upon said mass or cloud and varying the effect of such supplemental discharge motive fluid by varying the pressure thereof while maintaining the location of the supplemental discharge of said compressed motive fluid.

20. Means for applying coating comprising means to supply coating material, means to effect the discharge thereof through the action of a motive agent whereby the coating material is discharged in a finely divided condition, supplemental means to discharge a supplemental supply of the motive agent upon the discharged coating material to transform the latter into a sheet, and means to vary the supplemental discharge while maintaining the plane of said sheet.

21. Means for applying coating comprising means to supply coating material, means to effect the discharge thereof through the action of a motive agent whereby the coating material is discharged in a finely divided condition, supplemental means to discharge a supplemental supply of the motive agent upon the discharged coating material to transform the latter into a sheet, means whereby said supplemental means

may be turned through a wide arc upon its support without thereby interrupting the discharge of the supplemental supply of the motive agent, and means to vary the supplemental discharge at any point in said wide arc.

22. Means for applying coating comprising a main-head having means to supply coating material and also having means to effect a discharge thereof through the action of a motive agent whereby the coating material is discharged in a finely divided condition, a supplemental head mounted to turn upon said main-head and adapted to discharge a supplemental supply of the motive agent upon the discharged coating material to transform the latter into a sheet, and means to vary the supplemental discharge through said supplemental head without necessary turn of said supplemental head.

In testimony whereof, I have signed my name to this specification.

HERBERT W. DAY.