Jan. 18, 1938. F. O. CLIZBE ET AL 2,105,903

SPRAYING DEVICE

Filed Feb. 12, 1934 2 Sheets-Sheet 1

Fig. 1

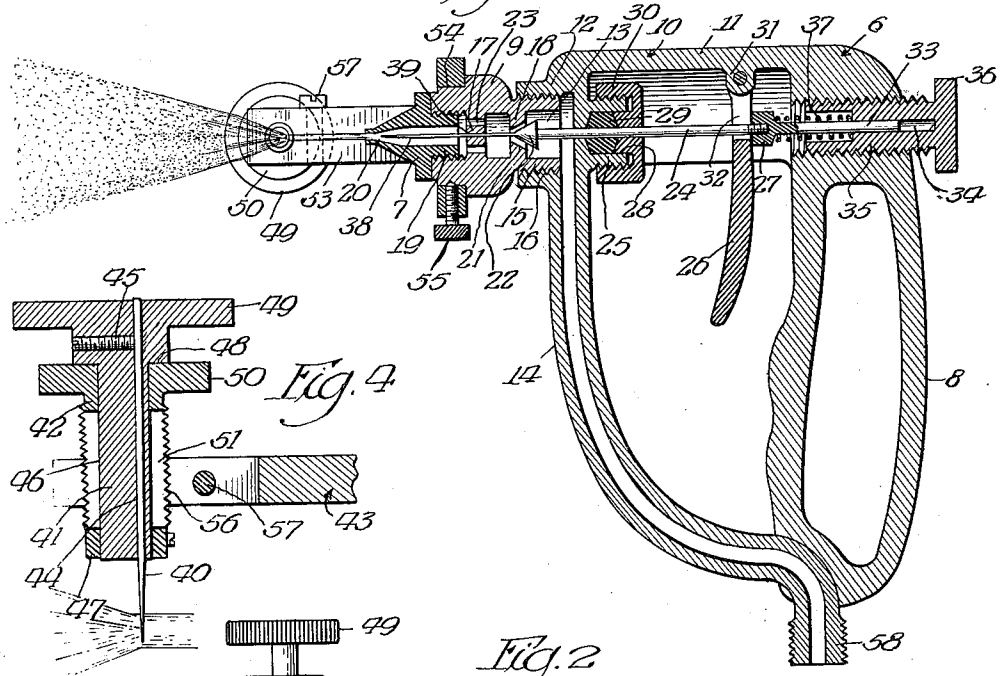


Fig. 4

Fig. 2

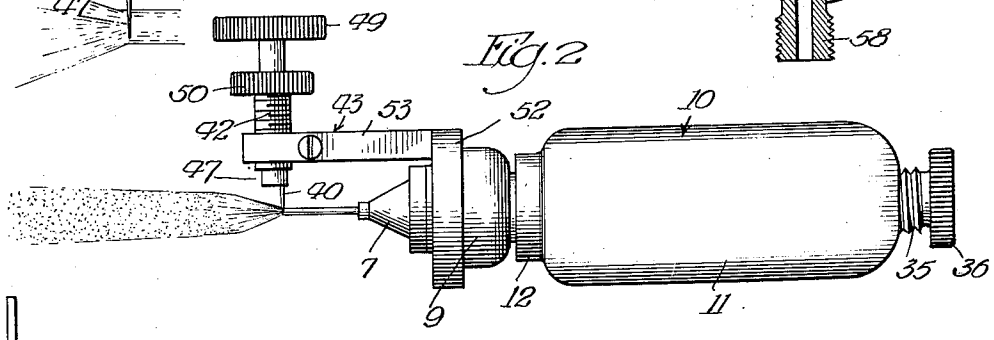
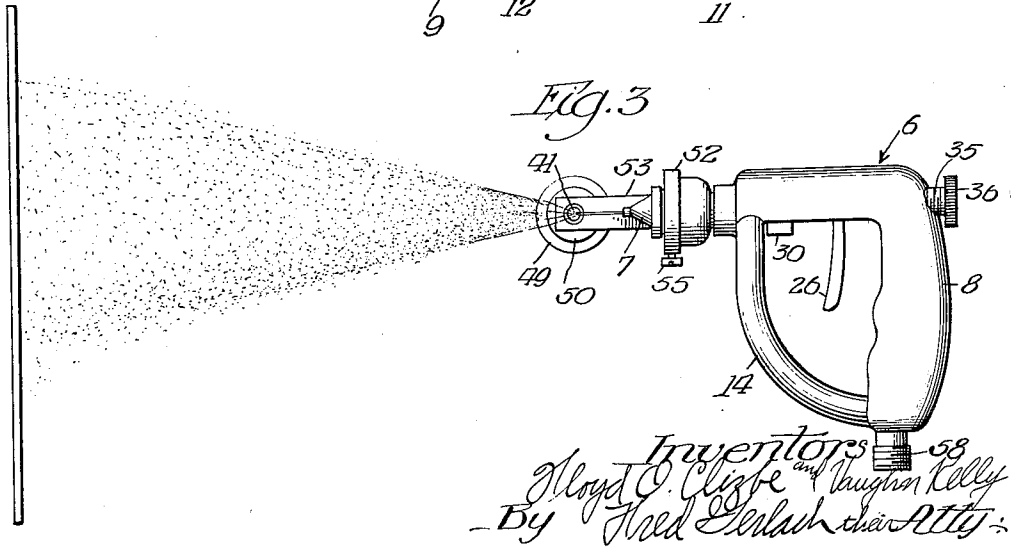


Fig. 3



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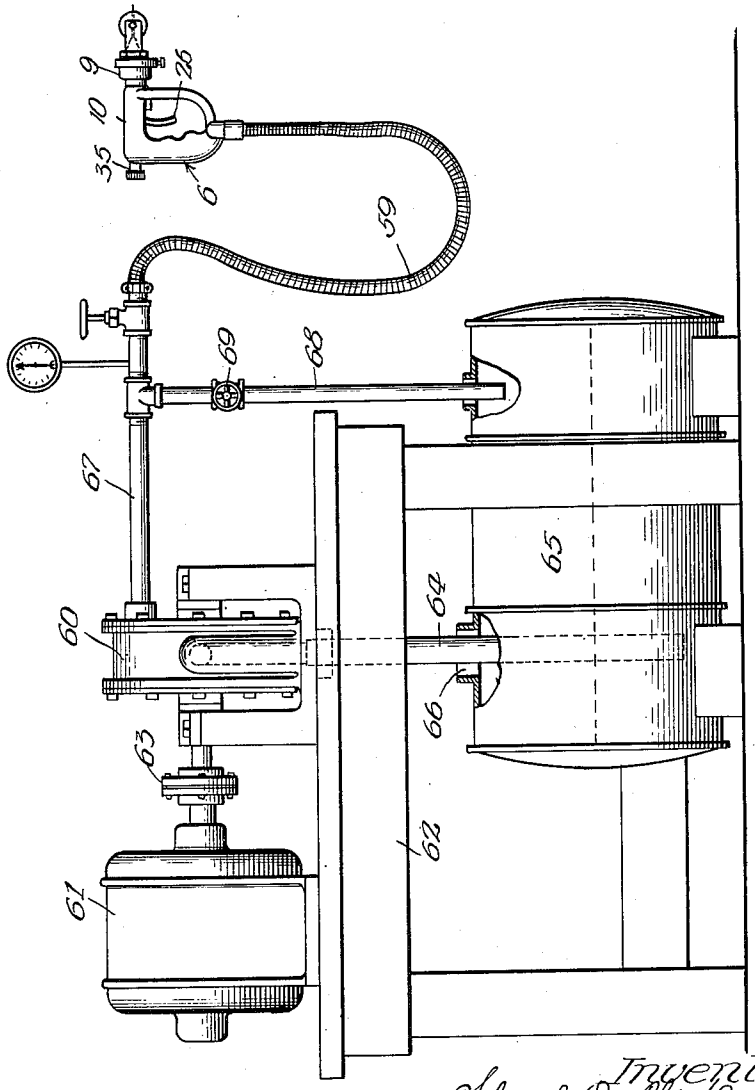


Fig. 5

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Patented Jan. 18, 1938 2,105,903

UNITED STATES PATENT OFFICE

2,105,903

SPRAYING DEVICE

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Application February 12, 1934, Serial No. 710,766

8 Claims. (Cl. 299—127)

The present invention relates generally to devices for applying lacquer, varnish and other such coating materials to surfaces. More particularly, the invention relates to that type of device which operates to apply the material by directing it in atomized form against the work and consists of a gun-type nozzle which is adapted to be held in the hand and moved bodily relatively to the work for coating purposes and receives the material from a drum or supply container by way of a flexible tube or like instrumentality.

Heretofore, compressed air has been used to effect atomization of the coating material as it leaves the nozzle and to direct the atomized material in sheet form against the work or surface to be coated. In practice it has been found that the use of compressed air in a device of this type is objectionable and renders the device inefficient for several reasons. In the first place, the air must be placed under from fifty to eighty pounds pressure in order to effect a proper discharge of the material from the nozzle with the result that there is a large quantity of air intimately mixed with the material and there is a tendency of the air when it is deflected laterally as the result of striking the work to carry a portion of the atomized material with it. This results not only in a great loss of material but also tends to produce a dull or fogged coating on the work. Secondly, the air in leaving the nozzle of the device at high velocity tends to pit and form roughness in the coating. Thirdly, because of the large quantity of air that is required properly to atomize the material, a comparatively large percentage of the solvent content of the material is dissipated by evaporation before the material strikes the work. Fourthly, it is necessary to dry the air and to clean it so as to remove all impurities therefrom. Another objectionable feature regarding the use of compressed air in a gun-type device of the type under consideration is that it is necessary to circulate air in an abnormally large quantity through the booth or space in which the device is used in order to provide for a complete elimination or exhaust of the gasified solvents and the solids in suspension in the booth or space and thus to eliminate the fire hazard and the possibility of imperiling or endangering the health of the person manipulating the device. Due to the fact that the air must, by necessity, be circulated through the booth or space in sufficient quantity completely to evacuate the gasified solvents and the solids in suspension and because the air cannot be recirculated and it is thus necessary to supply fresh air to the booth or space, the cost of spraying is materially increased, especially in cold or winter weather when the air must be heated.

The primary object of the present invention is to provide an improved device for coating surfaces with materials of the varnish or lacquer type which entirely dispenses with the use of compressed air as the medium for atomizing the material and directing it against the work and is more practical and efficient in operation than a device of the compressed air type in that it (1) comprehends the application of a maximum percentage of the coating material to the work; (2) avoids pitting and the formation of a rough coating because it dispenses with the use of high velocity air; (3) eliminates the possibility of a large percentage of the solvent or volatile content of the material being dissipated by evaporation before it strikes the work; (4) dispenses with the necessity of drying and cleaning air; and (5) necessitates the circulation of air in limited amount only through the booth or space in which the device is used. In this device, the flexible tube is adapted to receive the coating material from a high pressure pump and the nozzle serves to jet the material forwardly in a high velocity stream. Atomization of the material is effected by means of a needle which is supported on the device so that the point thereof is located in the direct path of, and extends almost through, the stream.

Another object of the invention is to provide a device of the last mentioned character in which the needle is supported in an eccentric position on a rotatable holder so that the point thereof in response to rotation of the holder may be shifted crosswise of the high velocity stream of material for centering purposes.

Another object of the invention is to provide a device of the last mentioned character in which the rotatable holder for the needle is carried by a screw which is mounted on a bracket on the device and is adapted in response to rotation to move the needle in and out with respect to the high velocity stream of material from the nozzle.

A further object of the invention is to provide a gun-type device for the purpose heretofore mentioned in which the bracket for supporting the screw is rotatably mounted on the body of the device so that the needle may be swung around the center of the stream of material in order to vary as desired the plane of the atomized sheet of material with respect to the body of the device.

A still further object of the invention is to provide a device for coating surfaces with material of the varnish or lacquer type which is generally of new and improved construction and is not only practical from an operating standpoint but may be manufactured at a low and reasonable cost.

Other objects of the invention and the various

advantages and characteristics of the present device will be apparent from a consideration of the following detailed description.

The invention consists in the several novel features which are hereinafter set forth and are more particularly defined by claims at the conclusion hereof.

In the drawings which accompany and form a part of this specification or disclosure and in which like numerals of reference denote corresponding parts throughout the several views:

Figure 1 is a vertical, longitudinal section of a device embodying the invention;

Figure 2 is a plan view, showing in detail the manner in which the needle point intercepts the high velocity stream from the nozzle and atomizes the material;

Figure 3 is a side view on a slightly smaller scale;

Figure 4 is an enlarged section of the needle holder and screw whereby the needle is carried so that it may be swung crosswise of the stream or moved to and from the stream; and

Figure 5 is a side view of the device showing it in connected relation with respect to a high pressure pump for supplying coating material to it via the flexible tube.

The device which forms the subject matter of the invention is adapted for the application of lacquer, varnish and other such coating materials to surfaces, and comprises a gun-type body 6 and a nozzle 7.

The body is adapted to be held in the hand and manipulated bodily over the work and consists of a handle 8 and a barrel 9. The handle is grooved or otherwise shaped to receive the fingers and to fit snugly within the hand and embodies a forwardly projecting extension 10. The latter is preferably formed integrally with the upper end of the handle 8 and embodies a semi-cylindrical wall 11 and a head 12. The head 12 is located at the outer end of the wall 11 and is shaped so that it embodies a chamber 13 having an open front. The coating material to be applied by the device is delivered under pressure and as hereinafter described, into the chamber 13 by a pipe 14 which is connected to the lower end of, and depends from the head 12, and has its lower end connected to the lower end of the handle 8. The barrel 9 is located directly in front of, and in alignment with, the chamber 13 in the head 12 and is provided at its rear end with an externally threaded, hollow stem 15. The latter engages an internal screw thread 16 in the front end of the head and serves removably to connect the barrel to the head. The barrel embodies a front cross wall 17 and a rear cross wall 18 and communicates with the chamber 13 in the head 12 by way of the stem 15. The nozzle 7 is connected to the front or outer end of the barrel 9 by means of a stem 19 and is shaped so that it embodies at the front end thereof a minute discharge orifice 20. The latter is longitudinally aligned with the barrel 9 and operates to jet the material in the form of a fine, high velocity stream and forwardly from the body 6 of the device. The stem 19 embodies an external screw thread which coacts with an internal screw thread in the front end of the head 9 to secure removably the nozzle to the barrel. The rear wall 18 of the barrel 9 is located at the rear or inner end of the barrel and has a tapered opening 21 in the central portion thereof. This opening forms a seat for a cone-shaped valve 22 and when open, permits the coating material to flow from the chamber 13 into the central portion of the barrel 9. The cross wall 17 is positioned forwardly of, and is spaced slightly from, the cross wall 18 and embodies an annular series of apertures 23 for conducting the coating material from the central portion of the barrel to the nozzle 7 for discharge via the orifice 20. The valve 22 serves to control the flow of material from the chamber 13 to the space between the cross walls 17 and 18 and is mounted on the front end of a stem 24. The latter extends slidably through a packing box 25 at the inner end of the head 12, and is actuated for valve-opening purposes by means of a trigger-like lever 26. The rear or inner end of the stem is disposed within the semi-cylindrical wall 11 of the extension 10 and is provided with a collar 27. The stuffing box 25 embodies a chamber 28 in which is disposed a wad of packing 29. This packing is compressed by a follower 30 so as to prevent leakage of the coating material around the stem 24. The trigger 26 is pivotally connected to, and depends from, a lug 31 on the inner face of the wall 11 of the extension 10 and has a slot 32 through which extends the rear end of the stem 24. The pivot for the trigger is so arranged that the trigger is free to swing to and from the handle. When the trigger is swung towards the handle, it strikes against the collar 27 and through the medium of the collar shifts rearwardly the stem 27 so as to unseat the valve 22. The collar 27 is removably connected to the rear end of the stem 24 by a screw thread connection and is provided with a rearwardly extending rod 33. The latter slides in a central, longitudinally extending hole 34 in a screw 35 and together with the screw forms a bearing for the rear end of the stem 24. The screw 35 extends through the upper end of the handle 6 and is provided with a knurled head 36 whereby it may be turned into place. A coil spring 37 is mounted on the front end of the rod. It extends between the collar 27 and the front end of the screw 35 and operates to urge the stem 24 forwardly so as to hold the valve 22 in its seated or closed position. In opening the valve, the trigger 26, as previously pointed out, is shifted rearwardly and compresses the spring 37. When the trigger is released, the spring shifts the stem 24 forwardly and seats the valve 22 in the seat-forming opening 21 and thus closes the barrel against flow of the coating material therethrough. In order to prevent clogging of the discharge orifice 20 in the nozzle 7, a wire 38 is provided. This wire is connected to the small end of the valve 22 and projects forwardly from the valve. It is slidably mounted in a hole 39 in the front cross wall 17 of the barrel 9 and extends through the nozzle 7 to the discharge orifice. During seating and unseating of the valve, the wire, because of its attachment to the valve, is shifted lengthwise in the nozzle and thus prevents clogging of the orifice.

In addition to the body 6 and the nozzle 7, the device comprises a sharp pointed needle 40. This needle is of the ordinary sewing or mending type and is carried by a holder 41 in such a manner that it extends at right angles to the direction of the stream of coating material emanating from the nozzle and operates to atomize the stream shortly after it leaves the discharge orifice 20. The holder 41 is carried by a screw 42 which in turn is carried by a bracket 43 on the barrel 9 of the device. The holder 41 embodies an eccentric or offset, longitudinal hole 44 for the large end of the needle 40 and embodies a set screw

45 for releasably holding the needle against lengthwise displacement in the hole 44. The screw 42 has a central, longitudinal bore 46 in which the holder 41 is mounted rotatably. The inner end of the holder extends slightly beyond the corresponding or adjacent end of the screw and embodies a collar 47 which abuts against such end of the screw and serves to hold the holder against lengthwise displacement in one direction with respect to the bore 46. The other or outer end of the holder 41 is provided with a shoulder 48 and a head 49. The shoulder 48 abuts against a knurled head 50 on the outer end of the screw and serves to hold the holder against longitudinal displacement in the opposite direction. The head 49 is knurled and is adapted to be gripped manually and turned in order to effect a crosswise adjustment of the pointed end of the needle with respect to the stream of coating material from the nozzle 7. The screw 42 is longitudinally slit as at 51 in order that it may be compressed into locking relation with the needle-holder 41. The bracket 43 consists of a ring 52 and a pair of jaws 53. The ring is rotatably mounted on an annular seat 54 on the outer periphery of the barrel 9 and embodies a set screw 55 whereby it may be locked to the barrel. By rotating the ring on the barrel, the radial position of the needle 40 with respect to the stream of coating material from the nozzle 7 of the device may be varied in order to change to the proper or desired extent the angular position of the sheet of atomized coating material relatively to the handle 8 of the body of the device. The jaws 53 extend forwardly from one side of the ring 52 and are shaped to form between them an internally threaded hole 56 for receiving the screw 51. A screw 57 extends through the jaws and is adapted when turned, to move the jaws either into or out of clamped relation with respect to the screw. When the screw 42 is rotated in one direction, the holder 41 is moved inwardly. When the screw is rotated in the opposite direction, the holder is moved away from the stream of coating material. By shifting the holder in or out, the needle point may be properly adjusted with respect to the stream of coating material from the nozzle 7 of the device. When the needle point is properly positioned so that the point thereof extends approximately seven-eighths of the way through the stream of material and is centrally positioned with respect to the stream, the needle may be locked in place by manipulating the screw 57 so as to draw together the jaws 43. When the jaws are drawn tightly together by the screw 57, the screw 42 is locked against rotation and is also compressed into clamped relation with respect to the needle holder 41. If during use of the device, it is necessary to adjust the needle point in order to obtain the proper or desired atomization of the stream of coating material from the nozzle, it is only necessary to loosen the screw 57 and then rotate either the screw 42 or the needle holder 41 or both. When the point of the needle 40 is arranged so that it extends approximately seven-eighths of the way through the stream of coating material and is centered as far as the stream is concerned, the stream, by the action of the needle point, is atomized. The atomized material moves swiftly from the needle point and is in the form of a comparatively thin, fan-shaped sheet. In practice it has been found that when the needle point extends approximately seven-eighths of the way through the stream, the atomized sheet is of substantially uniform consistency or density throughout. As a result of this, the surface or work against which the atomized sheet is directed is uniformly coated in response to swinging or rectilinear movement of the device relatively to the surface or work.

The lower end of the pipe 14 is provided with an externally threaded nipple 58 for connection to one end of a flexible tube 59. The other end of the tube is adapted to receive the coating material under pressure from an apparatus such, for example, as that illustrated in Figure 5 of the drawings. This apparatus comprises a high pressure pump 60 which is driven by an electric motor 61 and is mounted on a table-like structure 62. The motor is also mounted on the structure 62 and has the armature shaft thereof connected by a coupling 63 to the shaft of the rotor of the pump. The inlet side of the pump is connected by a pipe 64 to receive the coating material from a drum or like container 65 under the table-like structure 62. The pipe 64 extends downwardly from the pump and projects through an opening 66 in the drum to a point slightly above the bottom portion of the drum. The outlet side of the pump is connected by a horizontally extending pipe 67 to the inlet end of the flexible tube 59. A by-pass pipe 68 extends between the pipe 67 and the drum. This pipe provides for a return to the drum of a portion of the coating material that is drawn upwardly by the pump through the pipe 64 and has a control valve 69 for pressure-regulating purposes. By opening or closing this valve, the pressure of the coating material flowing through the flexible tube 59 may be regulated to the desired degree. When the motor 61 is in operation, the pump 60 is driven so that the coating material is drawn from the drum 65 and forced under pressure through the pipe 67 to the flexible tube 59. When the valve 22 is unseated with respect to the seat-forming opening 21 by swinging rearwardly the trigger-like lever 26, a portion of the coating material flows through the pipe 14 into the chamber 13. From the chamber, the material passes through the opening 21 into the space between the cross walls 17 and 18 in the barrel 9 and then flows via the aperture 23 to the nozzle 7. From the nozzle, the material flows outwardly through the orifice 20 in the form of a fine, high velocity stream which strikes against the point of the needle 40 and is atomized into a comparatively thin, fan-shaped sheet. The portion of the coating material which does not flow through the flexible tube 59 to the atomizing device flows back into the drum 65 through the by-pass pipe 68. When the trigger-like lever 26 is released, the coil spring 37 closes the valve 22 and thus stops the flow of material through the device. Under such circumstances, all of the material flows from the pipe 67 back to the drum 65 by way of the by-pass pipe 68.

In practice it has been found that satisfactory results are obtained when the coating material is forced through the flexible tube 57 and the pipe 14 at a pressure between 150 to 350 pounds per square inch and the discharge orifice 20 in the nozzle 7 is between 9/1000 and 10/1000 of an inch in diameter and the nozzle is formed as shown in the drawings. With this arrangement, the material when of the lacquer or varnish type and of spraying consistency, flows outwardly from the nozzle in jet form at a velocity of approximately 350 feet per second. When this fine jet or stream of coating material impinges or strikes against the point of the needle, the material is broken up into atomized form and a fan-shaped sheet or

spray is formed which may be directed against the work by proper positioning or manipulation of the device. In the event the needle is not properly centered or positioned with respect to the high velocity stream of coating material from the nozzle, adjustment may be obtained by rotating the needle holder 41 or the screw 42 as hereinbefore described. By virtue of the fact that no compressed air is utilized in connection with the atomization of the coating material, there is a minimum loss of the volatile, as well as the non-volatile portion of the material. In addition, the coating on the work is uniform and free from pits or unevenness.

The herein described device is simple in construction and may be manufactured at a low and reasonable cost. It is exceedingly efficient in operation because it does not rely upon the use of compressed air.

The invention is not to be understood as restricted to the details set forth, since these may be modified within the scope of the appended claims, without departing from the spirit and scope of the invention.

Having thus described the invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a device of the character described for applying coating material of the lacquer or varnish type, the combination of a nozzle having a minute discharge orifice, means for delivering the material under extremely high pressure to the nozzle for discharge through said orifice in a fine, high velocity stream, and a sharp, gradually pointed needle supported in the open in front of the nozzle so that the point thereof extends into the stream from one side and passes more than halfway across the stream in order to atomize the material and form it into a flat fan-shaped sheet for coating purposes.

2. In a device of the character described for applying coating material of the lacquer or varnish type, the combination of a nozzle having a discharge orifice of approximately 9/1000 of an inch, means for delivering the material to the nozzle at a pressure in excess of 150 pounds per square inch for discharge through said orifice in a fine, high velocity stream, and a sharp, gradually pointed needle supported in front of the nozzle so that it extends transversely of the stream and the point thereof passes more than half way through the stream and operates to atomize the material and form it into a substantially flat, fan-shaped sheet for coating purposes.

3. In a device of the character described for applying coating material of the lacquer or varnish type, the combination of a nozzle having a minute discharge orifice, means for delivering the material under extremely high pressure to the nozzle for discharge through said orifice in a fine, high velocity stream, a sharp, gradually pointed needle positioned in front of the nozzle so that it extends transversely of the stream and the point thereof passes more than half way through the stream and operates to atomize the material and form it into a substantially flat, fan-shaped sheet for coating purposes, and a support for the needle comprising means for adjusting the needle sidewise in order to provide for centering of the needle point with respect to the stream.

4. In a device of the character described for applying coating material of the lacquer or varnish type, the combination of a nozzle having a minute discharge orifice, means for delivering the material under extremely high pressure to the nozzle for discharge through said orifice in a fine, high velocity stream, a sharp, gradually pointed needle positioned in the open in front of the nozzle so that it extends transversely of the stream and the point thereof passes more than halfway across the stream and operates to atomize the material and form it into a substantially flat, fan-shaped sheet for coating purposes, and a support for the needle comprising a rotatable holder having an eccentric socket for the outer end of the needle and adapted upon rotation thereof to move the needle laterally in order to center the needle point with respect to the stream.

5. In a device of the character described for applying coating material of the lacquer or varnish type, the combination of a nozzle having a discharge orifice of approximately 9/1000 of an inch, means for delivering the material to the nozzle under pressure in excess of 150 pounds per square inch for discharge through said orifice in a fine, high velocity stream, a sharp, gradually pointed needle positioned in front of the nozzle so that it extends transversely of the stream and the point thereof extends into the stream and operates to atomize the material and form it into a flat fan-shaped sheet for coating purposes, and a support for the needle comprising means for adjusting the needle in a lengthwise direction.

6. A device of the character described for applying coating material of the lacquer or varnish type, the combination of a nozzle having a minute discharge orifice, means for delivering the material under extremely high pressure to the nozzle for discharge through said orifice in a fine, high velocity stream, a sharp, gradually pointed needle positioned in the open in front of the nozzle so that it extends transversely of the stream and the point thereof passes more than half way through the stream and operates to atomize the material and form it into a flat, fan-shaped sheet for coating purposes, and a support for the needle comprising means for adjusting the needle laterally and means for adjusting said needle in a lengthwise direction to and from the stream.

7. In a device of the character described for applying coating material of the lacquer or varnish type, the combination of a nozzle having a minute discharge orifice, means for delivering the material to the nozzle at a pressure in excess of 150 pounds per square inch for discharge through said orifice in a fine, high velocity stream, and means applied to the stream at a point directly in front of the orifice for breaking up and atomizing said stream and forming the latter into a substantially flat, fan-shaped sheet for coating purposes.

8. In a device of the character described for applying coating material of the lacquer or varnish type, the combination of a nozzle having a discharge orifice of approximately 9/1000 of an inch means for delivering the material to the nozzle at a pressure in excess of 150 pounds per square inch for discharge through said orifice in a fine, high velocity stream, and means applied to the stream at a point directly in front of the orifice for breaking up and atomizing said stream and forming the latter into a substantially flat, fan-shaped sheet for coating purposes.

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