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W. H. ANDREWS

1,919,153

SPRAYING DEVICE

Filed July 26, 1929

2 Sheets-Sheet 1

*Fig. 1.*

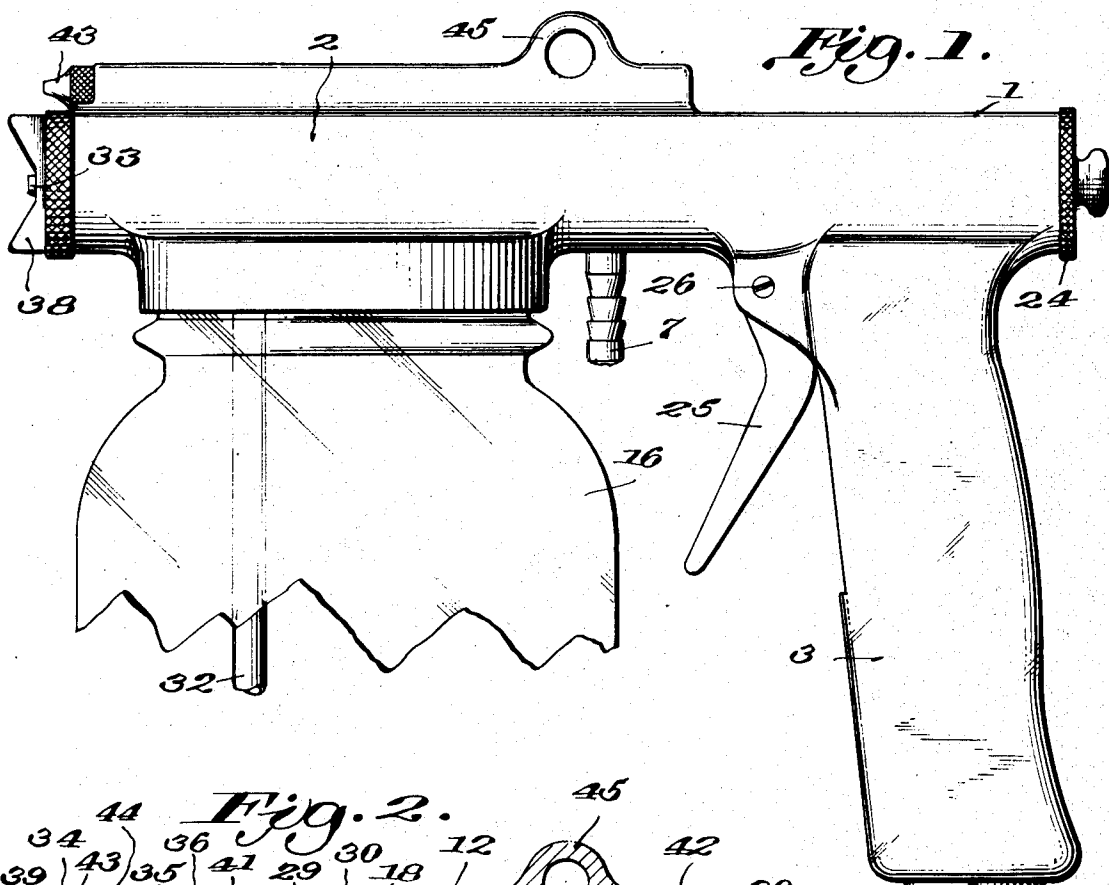
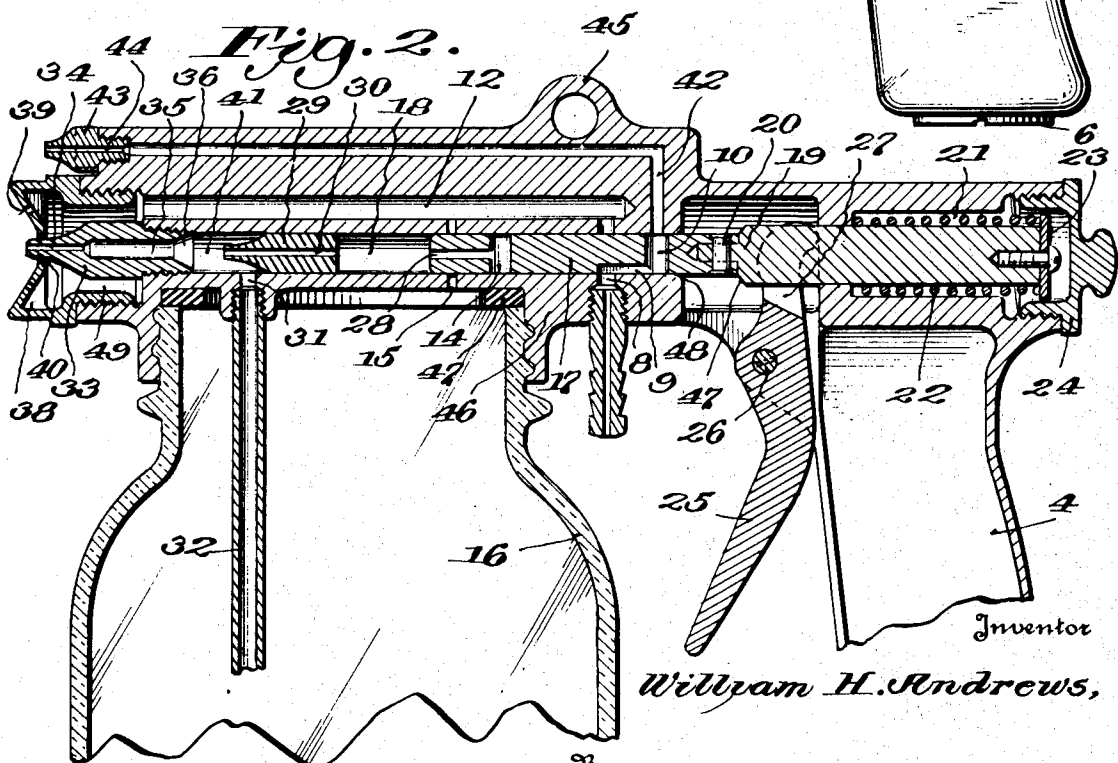


*Fig. 2.*



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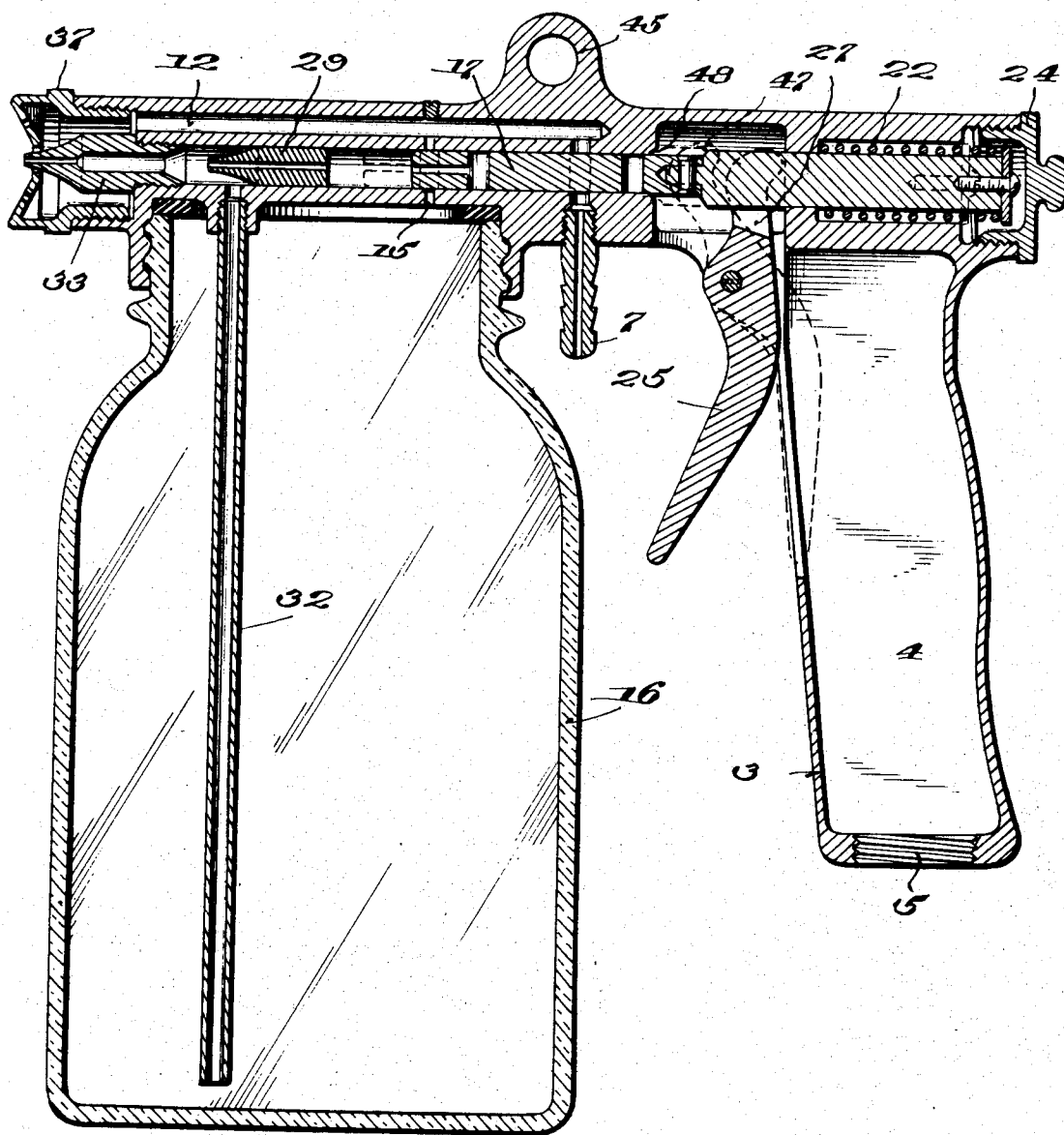
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2 Sheets-Sheet 2

*Fig. 3.*



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## UNITED STATES PATENT OFFICE

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## SPRAYING DEVICE

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This invention relates to improvements in devices for spraying paints, lacquers or other liquids, finely divided solid particles such as insect powders, etc., and the principal object is the provision of such a device which is highly efficient in operation, simple and easily controlled to use a minimum amount of material and a minimum amount of pressure to secure the very best results.

Another object includes such a device in which the trigger control is accurate and simple, which operates at either low or high air pressures and volumes and with a small consumption of material thereby reducing the amount of mists and fumes to a minimum while still affording perfect atomization of the material.

Another object of the invention is the provision of a new and improved form of commingling chamber wherein the air and material to be sprayed is perfectly commingled prior to the final step of atomization and spraying. This feature is apparently new and is brought about in a manner later to be described. By causing this primary commingling of the air and material in the novel manner set forth herein, none of the material, and this is particularly important in the use of paints and lacquers, is permitted to come in contact with the moving valve member whereby the same is caused to clog or stick in the working barrel. Furthermore, a more perfect commingling of the air and material is brought about as compared to prior devices of the same class.

Another object of the invention is the provision of such a device in which the complete body and handle are made of one piece of material, preferably by die-casting or forging, thereby simplifying the manufacture of the same and bringing the completed article within the price range of the individual householder as well as the commercial concerns making use of such a spraying device. At the same time, a more attractive and substantial device is provided by this invention.

Another object is the provision of a device employing an air relief passage which will be brought into use where an air compressor is being used which can not be regulated, that

is, the compressor is being operated continuously and is not adapted to be shut off intermittently.

Another object relates to the provision of a hollow handle or magazine wherein extra spray flattening members or spray nozzles may be safely kept for future use.

Further objects will include improvements in various details of construction which will be hereinafter set forth in greater detail.

The invention is illustrated in the accompanying drawings, in which Figure 1 represents a side elevation of the device constructed to embody the invention;

Figure 2 represents a vertical longitudinal cross section through the device in inoperative or closed position;

Figure 3 is a view similar to Figure 2, showing a slightly modified construction of the device.

Referring now to the drawings, 1 indicates the body of the spraying device which includes the barrel portion 2 and the handle portion 3, which handle portion extends downwardly therefrom and is inclined slightly to the rear, thereby giving to the whole the appearance of an automatic firearm.

The handle portion is preferably made hollow, as indicated at 4 and has in the extreme lower portion thereof a screw threaded opening 5 adapted to be closed by a cap 6. The object in making the handle hollow is to provide a storage space or magazine for spare parts to be used on the device, such as nozzles and spray heads.

A spraying device of the type herein shown is employed in various industries and homes today for spraying paints, lacquers, insect powders, various spraying liquids, insecticides, etc., and it is necessary that the material be sprayed or atomized by air under pressure. The material is conveyed to the point of atomization by air pressure and it is an object of this invention to provide passageways and valve members for controlling the air pressure and the passage of the material and the mixing and atomization thereof.

To this end the body member 2 is provided longitudinally thereof with a cylindrical bore

or commingler pipe 18, extending from one extreme end of the body to the other. This bore is made similar to the bore in a gun except that the rifling is omitted. Within said bore is inserted a solid cylindrical valvular member 17, having a close longitudinal sliding fit therein. This valvular member is preferably made in two parts, 17 and 19, as shown, the part 19 being slightly greater in diameter than the part 17 and being secured together by a metal pin or rivet 20 for ease in assembling. This valvular member can also be made in one integral part, but this method of construction may be adopted at will. The valvular member extends rearwardly in a horizontal direction and projects into a spring chamber 21 bored centrally in the body 2. A washer 23 is secured to the valvular member and a compression spring 22 is positioned around that portion of the valvular member extending into the spring chamber. The end of the spring chamber is closed by a screw threaded end plate or knob 24, engaging suitable screw threads in the body 1.

The valvular member is given a forward, longitudinal movement by depressing a trigger 25, pivoted to the body at 26 and carrying at its upper portion, bifurcated members 27 engaging opposite sides of the valve member. This may be accomplished by causing flat recesses to be formed in the otherwise cylindrical valve member adapted to receive the bifurcated members or the bifurcated members may be pivoted to the valve member. The particular mode of engagement forms no part of my invention there being any number of methods for accomplishing this, at present in use.

The valvular member 17, which, as heretofore explained is a solid cylindrical member, has therein several passageways for bringing about certain results soon to be explained. As shown, on the bottom portion thereof is provided a passageway or flat spot 9, running for a short distance along said valve member and being formed by filing or milling the cylindrical surface of the valve member. This passageway merges or communicates with another passageway or port 10, drilled vertically through the valve member 17. To the left of this passageway and at some distance therefrom is a similar passageway or port 14, drilled through the valve member 17. These ports are of such a distance apart as to register with passageways 8 and 15, cast or cut into the body 1 and communicating with the bore 18; that is, the center to center distance between passageways 8 and 15 is the same as the center to distance between the ports 10 and 14. From the extreme left end portion of the valve member 17 there is drilled horizontally a passageway 28 which communicates with the bore 18 and with the port 14.

Taken broadly, the bore 18 may be considered as a commingler pipe, having at one of its ends the pressure connection 7, the suction connection 31 intermediate its ends and the discharge outlet 34 at its opposite end. Adjacent the suction connection 31, in the bore, and situated between said connection and the valve member 17 is a suction nozzle 29, tapered at its forward end to form a nose and having drilled horizontally therethrough a bore 30 which alines with the bore 28. This suction nozzle is secured in the bore 18 by means of a force fit although it is within the scope of my invention to make it integral with the valve member 17. However, when the suction nozzle is made separately, as shown, and finally assembled, there is a space left between said nozzle and the extreme left portion of the valve member in its inoperative position as shown in the drawings. This space will be occupied by the valve member when moved longitudinally to its operative position by depressing the trigger and the bores 30 and 28 will form practically one continuous passageway.

An ejector nozzle 33 is secured by means of screw threads to the body of the spraying device at the discharge end of the commingler pipe. This nozzle has a continuous longitudinal bore through its central portion, said bore being composed of two bores of varying diameters, the outlet bore 34 being of smaller diameter than the bore 35. The bore 35 is flared outwardly at its margin as shown at 36, for the purpose of giving a Venturi throat effect when considered in connection with the tapered nose of the suction nozzle 29.

Surrounding the ejector nozzle 33 and adjustably secured to the spraying device by means of screw threads is the conventional spray flattening member 37, forming no part of my invention. This spray flattening member has a flat face provided with two lugs 38 forwardly projecting, through which the ports 39 are drilled. These projections have forward faces approximately at right angles to the ports extending through these projections. The member 37 has an aperture at its centre which is sufficiently larger in diameter than the forward end portion of the nozzle core to permit a hollow stream of compressed air to issue through the space thus formed. When thus issuing this hollow stream of compressed air laterally houses the stream of material issuing through the axial bore of the nozzle core so as to prevent a decided spreading of the material stream until the latter is engaged by the converging air jets issuing from the ports 39. These converging air jets are well known in the art as flattening jets and their axes converge after the manner of the edges of a flattened pyramid toward the axis of the aperture whereby air jets issuing from these ports 39 will intersect at a common point on the

stream of material issuing from the ejector nozzle.

It will be noted from the drawings, that a chamber is formed between the ejector nozzle and the suction nozzle and that this chamber is in communication with the suction opening 31 and with the bores 30, 34, and 35. This chamber is preferably designated as the commingler chamber and will be designated as 41. This chamber forms a very important part of my invention and the function which it performs will be explained hereinafter.

The body of the spraying device has attached thereto a hose nipple 7 to which an air hose may be attached and led to a suitable air compressor, not shown. Normally, the type of air compressor designed for use with a spraying device of this type may be regulated to suit the load on the compressor, that is, it may be started and stopped intermittently. However, this spraying device might possibly be used with an air compressor which can not be regulated in the manner described, that is, the compressor is under a continuous run and since the sprayer is not being used constantly, some provision must be made to take care of the excess air pressure. This is accomplished, in the present invention by providing an air relief passage 42 which, in the inoperative position of the valve member 17, communicates with the port 10 and the passageway or flat spot 9 and thence through passageway 8 to the air compressor. With the compressor running continuously and the valve member in the inoperative position, air will continually escape through the passageways mentioned and escape to atmosphere through the nozzle 43 containing passageway 44.

The only difference between the devices shown in Figures 2 and 3 is that in Figure 3, the air discharge passageway has been omitted entirely from the assembly and consequently the body portion can be made smaller since no provision need be made for the upstanding portion adapted to contain the air discharge passageway 42.

The barrel portion is provided with the apertured lug or flange 45 which provides a convenient hanging means and normally falls at the balancing point of the spraying device.

It is to be noted that the dispensing tube 32 is somewhat to one side of the center of the container 16, which normally consists of the well known Mason jar. This jar is provided with screw threads which engage corresponding screw threads in the flange 46 provided in the body member of the device. Any form of sealing gasket 47 may be employed between the edge of the jar and the flange. The object in placing the tube 32 slightly to one side of the center of the jar is that experience has shown that the sprayer is used

most of the time in a position in which the discharge nozzle is pointing downwardly at an angle. Consequently as the level of the material in the jar decreases, the material will tend to lie in one corner of the jar, leaving the bottom exposed in the remaining portion. Therefore, the tube will always be immersed in the material whereas, if the tube engages the material at the center of the jar, not nearly as much of the material can be dispensed when the level in the jar decreases to a negligible quantity.

Assuming now, for an example, that the spraying device is to be used for spraying any of the well known lacquers, the material is placed in the jar and the spraying device is screwed upon the jar. The compressor is started. The operator depresses the trigger 25 to the dotted line position, thereby causing the valve member to move longitudinally to the left and causing the various ports to align as before described. Air under pressure, flows through the ports and takes three distinct directions; the first through port 10, passageway 12, port 15 and into the jar 16 where it exerts pressure upon the material therein, serving to force the same up through tube 32. Also, the air pressure passes from passageway 12, through port 14, bore 28, bore 30 and issues from the suction nozzle 29, thereby creating a suction which tends to suck up the material in tube 32. Also, the air and material undergo a complete commingling in the chamber 41, prior to any atomization, and this feature is important. Intimate mixing occurs in the commingler chamber 41 and it has been found that this mixing, prior to atomization, accounts for the remarkable results achieved by this spraying device. The valve member cannot become clogged up and if the material has any solvent properties, no destructive effect is brought to bear upon the moving valve parts. Air cannot find its way to the rear of the valve member because the valve member is enlarged at 47, forming a shoulder which seats against the valve seat 48 when the valve is moved to operative position. Furthermore, by causing intimate mixture in the chamber 41, it has been found that the ejector nozzle 33 does not become clogged with the material, thereby eliminating frequent shut-downs for cleaning parts. The third path for the air under pressure is directly through the passageway 12 to the atomizing chamber 49 where the air is caused to issue in a hollow stream and laterally house the stream of intimately mixed material issuing through the axial bore of the nozzle core, as hereinbefore described.

The air relief passageway is functioning when the device is inoperative if a continuous run air compressor is being used, in the manner heretofore described.

Normally, the spraying device is adapted

to be used with low air pressures, that is, pressures ranging between four and forty pounds. If it is desired to employ extremely high air pressures such as fifty to one hundred and fifty pounds, in order to avoid breaking the glass jar, passageway 15 leading to the jar 16 is plugged up or dispensed with and the air pressure follows the two passageways remaining, heretofore described. For average use, however, the lower range of pressures is adhered to and therefore the air pressure is permitted to seek out the three routes before described.

The device is composed of very few wearing parts, being made strong and capable of very severe use. An even flowing stream is assured and materials are handled with remarkable ease. The flow is under perfect trigger control and the device is well balanced, light in weight and remarkably easy to clean.

I claim:

1. In combination in a sprayer having a main body member, a commingler pipe having a pressure connection at one end and a suction connection intermediate the ends thereof; of an atomizer at the opposite end and communicating with a primary atomizing air passageway contained within the body member and said commingler pipe, said primary atomizing air passageway and said commingler pipe extending longitudinally and parallel with each other and being intercommunicating at the pressure end of said commingler pipe only.

2. In combination in a sprayer having a main body member, a commingler pipe having a pressure connection at one end and a suction connection intermediate the ends thereof; of an atomizer at the opposite end and communicating with a primary atomizing air passageway contained within the body member and said commingler pipe, said primary atomizing air passageway and said commingler pipe extending longitudinally and parallel with each other and being intercommunicating at the pressure end of said commingler pipe only and valvular means controlling said pressure connection with said valvular means consisting of a manually operated valve member longitudinally slidable in said commingler pipe.

3. In an automatic sprayer and mixing device comprising a main body member and a handle, a trigger in the handle and a commingler pipe connected to the handle; a pressure connection at one end and a suction connection intermediate the ends of said pipe, an atomizer at the opposite end and having extended therethrough an ejector nozzle, and communicating with a primary atomizing air passageway contained within the body member and said commingler pipe, a draw-

ing nozzle provided with a longitudinal central bore intermediate the ends of said commingler pipe and adjacent to said suction connection thereby forming a commingler chamber between said nozzles, said primary atomizing air passageway and said commingler pipe extending longitudinally and parallel with each other and being intercommunicating at the pressure end of said commingler pipe only, and valvular means slidably mounted in said commingler pipe approaching said drawing nozzle and operatively connected with said trigger.

4. In a sprayer of the type described, an ejector nozzle, a body member supporting said nozzle and having a bore therein and an atomizing air passageway leading from said bore to said nozzle, air supply means connected to said bore, a valve member slidably mounted in said bore for controlling the passage of air from said supply means to said ejector nozzle by means of two distinct parallel passageways, said valve member having a plurality of apertures extending therethrough and adapted to align with said distinct passageways simultaneously according to the position of said valve member with respect to said bore.

5. In a sprayer of the type described, an ejector nozzle, a drawing nozzle, a body member supporting said nozzles and having a bore therein and an atomizing air passageway leading from said bore to said ejector nozzle, air supply means connected to said bore, a valve member slidably mounted in said bore for controlling the passage of air from said supply means to said nozzles by means of two parallel distinct passageways, said valve member having a plurality of apertures extending therethrough and adapted to align with said distinct passageways simultaneously according to the position of said valve member with respect to said bore.

6. In a sprayer of the type described, an ejector nozzle, a drawing nozzle spaced from said ejector nozzle to form a commingler chamber between said nozzles, a body member supporting said nozzles and having a bore therein and an atomizing air passageway leading from said bore to said ejector nozzle, air supply means connected to said bore, a valve member slidably mounted in said bore for controlling the passage of air from said supply means to said ejector nozzle and to said commingler chamber by means of two distinct parallel passageways, said valve member having a plurality of apertures extending therethrough and adapted to align with said distinct passageways simultaneously according to the position of said valve member with respect to said bore.

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