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J. A. PAASCHE

2,401,503

AIR SPRAYING DEVICE

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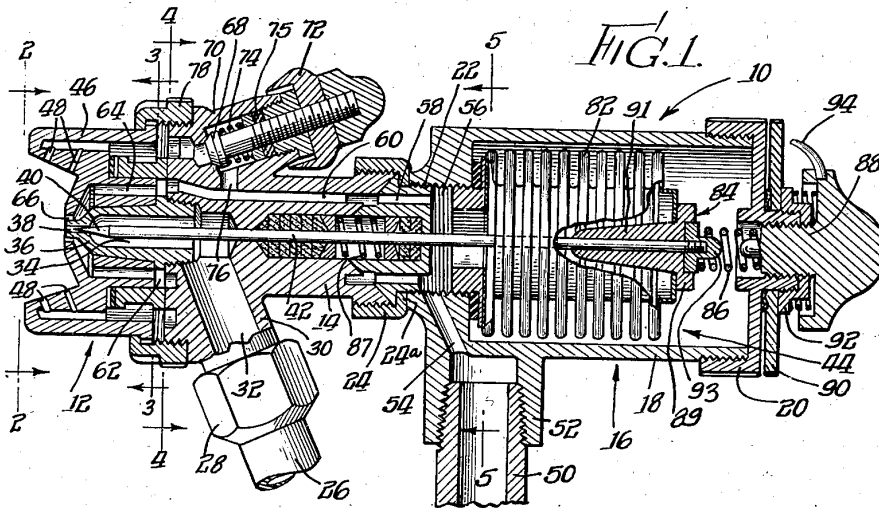


FIG. 3.

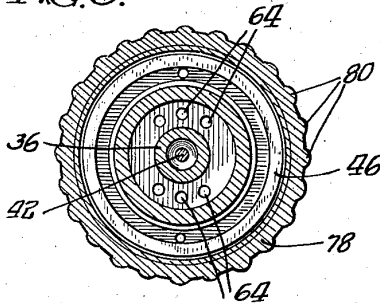


FIG. 2.

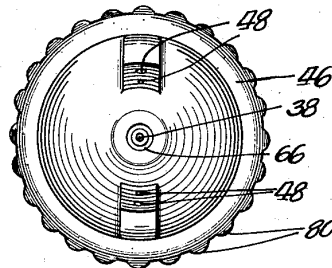


FIG. 4.

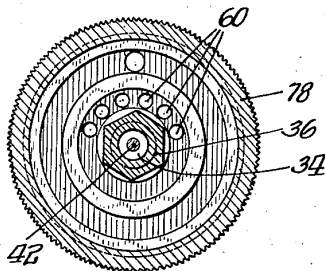
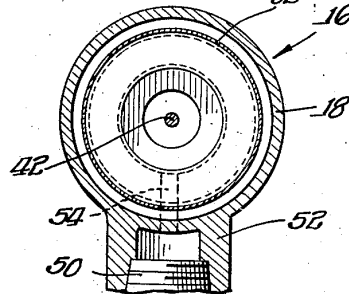


FIG. 5.



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**AIR SPRAYING DEVICE**

Jens A. Paasche, Chicago, Ill.

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3 Claims. (Cl. 299-140)

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This invention relates generally to a spray or airbrush device and more particularly to airbrush devices equipped with improved control valve structures.

The present invention is particularly concerned with improvements in valve controlling mechanisms employed to govern the volume of liquid such as paint to be applied to a work surface in the form of a spray. It has heretofore been the practice in some instances, as shown in my earlier Patent No. 2,059,706, to control the delivery of liquid such as paint by a piston operated valve mechanism. Such mechanisms have certain functional deficiencies which the present invention seeks to overcome. For example, piston operated valve mechanisms are subject to wear and consequent leakage. Also such devices require continuous lubrication. The present invention contemplates a spray device in which valve control may be obtained by mechanism which is not subject to the wear experienced by a piston and which need not be lubricated.

More specifically, the present invention contemplates an improvement in the bellows of that type of spraying device in which a liquid control valve may be shifted in response to the expansion of a pressure responsive means such as a bellows which is connected with the air line.

The foregoing and other objects and advantages will be more apparent from the following detailed description when considered in connection with the accompanying drawing, wherein—  
Fig. 1 is a central longitudinal sectional view of a spraying device which is representative of one embodiment of the present invention;

Fig. 2 is an end elevational view of the device, said view being taken from the left of Fig. 1 substantially along the line 2-2 thereof;

Fig. 3 is a transverse sectional view taken substantially along the line 3-3 of Fig. 1;

Fig. 4 is a transverse sectional view taken substantially along the line 4-4 of Fig. 1; and

Fig. 5 is a transverse sectional view taken substantially along the line 5-5 of Fig. 1.

Referring now to the drawing more in detail wherein like numerals have been employed to designate similar parts throughout the various figures, it will be seen that one embodiment of the present invention constitutes a spraying device which is designated generally by the numeral 10. This device 10 comprises a forward portion or nozzle assembly generally designated by the numeral 12, a central body portion 14 which carries the nozzle assembly 12 and a rearwardly positioned bellows supporting structure designated generally by the numeral 16. The bellows supporting structure 16 includes a cylindrical casing or housing 18 which is closed at its rear or right extremity, Fig. 1, by a closure member 20. The opposite extremity of the housing 18

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is reduced and internally threaded to receive a bearing member 22. This bearing member 22 has a conical outer bearing surface which is complementary to a conical bearing surface on the body 14, and these two bearing surfaces are secured against each other through the agency of a coupling nut 24, Fig. 1. This nut 24 makes a threaded engagement with the periphery of the right extremity of the body 14 and is provided with a flange portion 24a which bears against a shoulder on the bearing member 22.

Liquid such as paint is introduced to the front extremity of the sprayer device 10 through a suitable conduit 26 which is coupled at 28 with a nipple 30 formed integral with and extending outwardly from the central body portion 14. The fluid or liquid passes through a channel 32 and thence into a chamber or passage 34 within a nozzle tip 36 which forms a part of the nozzle assembly 12. The communication between this passage 34 and a restricted discharge orifice 38 is controlled by a needle valve member 40. The degree to which the valve member 40 is open will determine the amount of paint discharged in a small stream through the discharge orifice 38. The valve member 40 forms a part of an elongated valve stem 42 which is coupled at its opposite or right extremity, Fig. 1, with a pressure responsive bellows mechanism designated generally by the numeral 44, later to be described. It will be seen that the nozzle tip 36 makes threaded engagement with the left or outer extremity of the central body portion 14 and is provided with an outer tapered surface for accommodating an air cap or fanning head 46.

The stream of paint discharged from the orifice 38 is acted upon by fluid or air streams from discharge ports 48 and this causes the solid material stream issuing from the orifice 38 to be transformed into an atomized stream comprised of small particles of substantially uniform size delivered against the surface to be treated. For a more detailed description of the fanning effect produced by such ports, reference is made to my Patent No. 2,139,133, dated December 6, 1938.

For a clear understanding of the present invention it will suffice to say that fluid or air under pressure is introduced through a conduit 50 which is coupled with a nipple 52 formed integral with and extending radially of the housing 16. This air under pressure passes through a channel 54 which communicates with a central chamber 56. This chamber 56 communicates with a plurality of longitudinal passages 58 in the bearing member 22 and registering longitudinal passages 60 within the body portion 14. These longitudinal passages 60 communicate with an annular chamber 62. Diametrically positioned passageways 64 in the fanning head 46 communicate at one extremity with the annular chamber 62 and



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at the opposite extremity with the restricted discharge passage or area 66 in the vicinity of the paint discharge orifice 38. Air passing through the discharge orifice or port 66 envelops the column of paint or other material issuing from the restricted orifice 38 in a tubular air sheath which serves to initiate breaking up the material stream and to carry the material toward the surface of the body to be treated in the form of a head spray of substantially round pattern circumscribing only a relatively small area. The air streams issuing from the ports 48 cooperate with the air streams from the annular port 66 to produce the desired spreading or fanning of the material directed to the work surface.

The volume of air issuing from the ports 48 is controlled by a valve member 68. This valve member 68 is mounted within a nipple or a housing 70 formed integral with the central body portion 14. The outer extremity of the valve member 68 is connected with a knob 72 which may be manually rotated to control the space between the valve member 68 and its complementary valve seat. A coiled spring 74 surrounding the valve 68 serves to prevent inadvertent adjustment thereof and also to retain and compress packing material 75 in place. This prevents leakage of air along the stem of the valve member 68. A passage 76 establishes communication between the valve 68 and one of the longitudinal passages 60. When the valve 68 is open, communication is established between this passage 76 and the restricted discharge ports 48. At this point it should be understood that the fanning head 46 is clamped against the left extremity of the central body portion 14 through the agency of a suitable clamping ring 78 which is provided with knurlings or protuberances 80 along its outer surface to facilitate manual adjustment thereof.

From the foregoing description it will be apparent that in order for material such as paint to be discharged through the orifice 38 the valve 40 must be open. This valve is normally closed when not in use. However, as soon as air under pressure is introduced through the conduit 50 and into the central chamber 56 expansion of a bellows 82 takes place. The right extremity, Fig. 1, of this bellows 82 is connected to the valve stem 42 by a coupling 84. A coiled spring 86 is interposed between the coupling 84 and the closure or cap 20. This coupling 84 includes a member 89 having a peripheral portion projecting beyond the bellows which is hexagonal and an inner portion 91 which projects within the bellows and provides a support for the valve stem 42. The right extremity of the valve stem 42 is threaded to receive a member 93 which provides a seat for the left extremity of the coiled spring 86 and which is adapted to be slidably nested within a complementary recess provided in the member 89. This provides a very simple structure to facilitate removal of the valve stem without disturbing the bellows proper. Thus when the bellows 82 expands to the right, this expansion takes place against the coiled spring 86. The extent to which the valve 40 will open will be dependent upon the pressure exerted against the bellows 82.

A coiled spring 87 surrounding the valve stem 42 serves to retain packing rings at opposite extremities thereof in position. The action of the spring 87 is such as to compress the packing positioned at each extremity thereof and thus prevent leakage along the valve stem. By employing the bellows 82 and its associated parts, instantaneous opening of the valve 40 is accomplished.

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It has been found that by employing the air pressure responsive bellows arrangement a very sensitive and positive control of the valve is assured. Furthermore, as previously pointed out, the use of the bellows or Syphon arrangement, as distinguished from a piston and cylinder arrangement, eliminates the necessity of lubricating the parts to insure sensitive and positive action and also eliminates wear resulting from friction. The pressure exerted by the spring 86 and consequently the responsiveness of the bellows 82 to variations in pressure may be controlled by a manually adjustable screw member 88. This screw member 88 makes a threaded engagement with the cap 20. Rotation of the screw member in a clockwise direction, as viewed from the right, causes it to move inwardly and thus subject the coiled spring 86 to increased compression. In this manner the opening of the valve member 40 in response to various air pressures may be controlled. A suitable disc 90 is secured upon the cap 20 by a nut 92. This disc 90 may be suitably graduated to indicate various pressure settings for the screw 88. A pointer member 94 carried by the screw 88 serves to designate the pressure setting as indicated upon the disc 90.

From the foregoing it will be apparent that the present invention contemplates a spray or air-brush device of improved practical construction. The control of material or paint delivered to the restricted discharge orifice by the use of the pressure responsive bellows mechanism previously described represents a distinct advancement over prior devices with which I am familiar. By employing the pressure responsive bellows arrangement positive opening of the valve is assured with improved sensitivity. The simplicity of the bellows control arrangement enables it to be economically produced, and the elimination of shiftable plungers, pistons or the like, requiring constant lubrication and encountering considerable wear, makes for efficiency in operation. Also the practical arrangement of the valve mechanism for controlling delivery of air under pressure to the fanning head represents a distinct improvement over controls previously employed.

Obviously the invention is not limited to the specific structural details disclosed herein but contemplates other modifications and changes without departing from the spirit and scope of the appended claims.

The invention is hereby claimed as follows:

1. A spraying device, including in combination a nozzle, means for supplying liquid to be sprayed to said nozzle, a valve for controlling the flow of said liquid, means for supplying a gas under pressure to said nozzle, a Syphon bellows, a bushing carried by said bellows, said valve having a stem slidably housed in said bushing, said stem having a head, a seat formed on said bushing, said head being positioned on said seat, a spring in contact with said head and biased to urge the head to its seat in the bushing, and means providing communication between said gas supplying means and the interior of said Syphon bellows.
2. A spraying device as in claim 1, including in combination a housing, said bellows being positioned in said housing, and means for removably securing said nozzle to said housing.
3. A spraying device as in claim 1, including in combination means for adjusting the bias of said spring and spring means for retaining said adjusting means in adjusted position.

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