

April 1, 1952

J. W. MOORE
SPRAYING DEVICE

2,591,585

Filed Aug. 14, 1947

2 SHEETS—SHEET 1

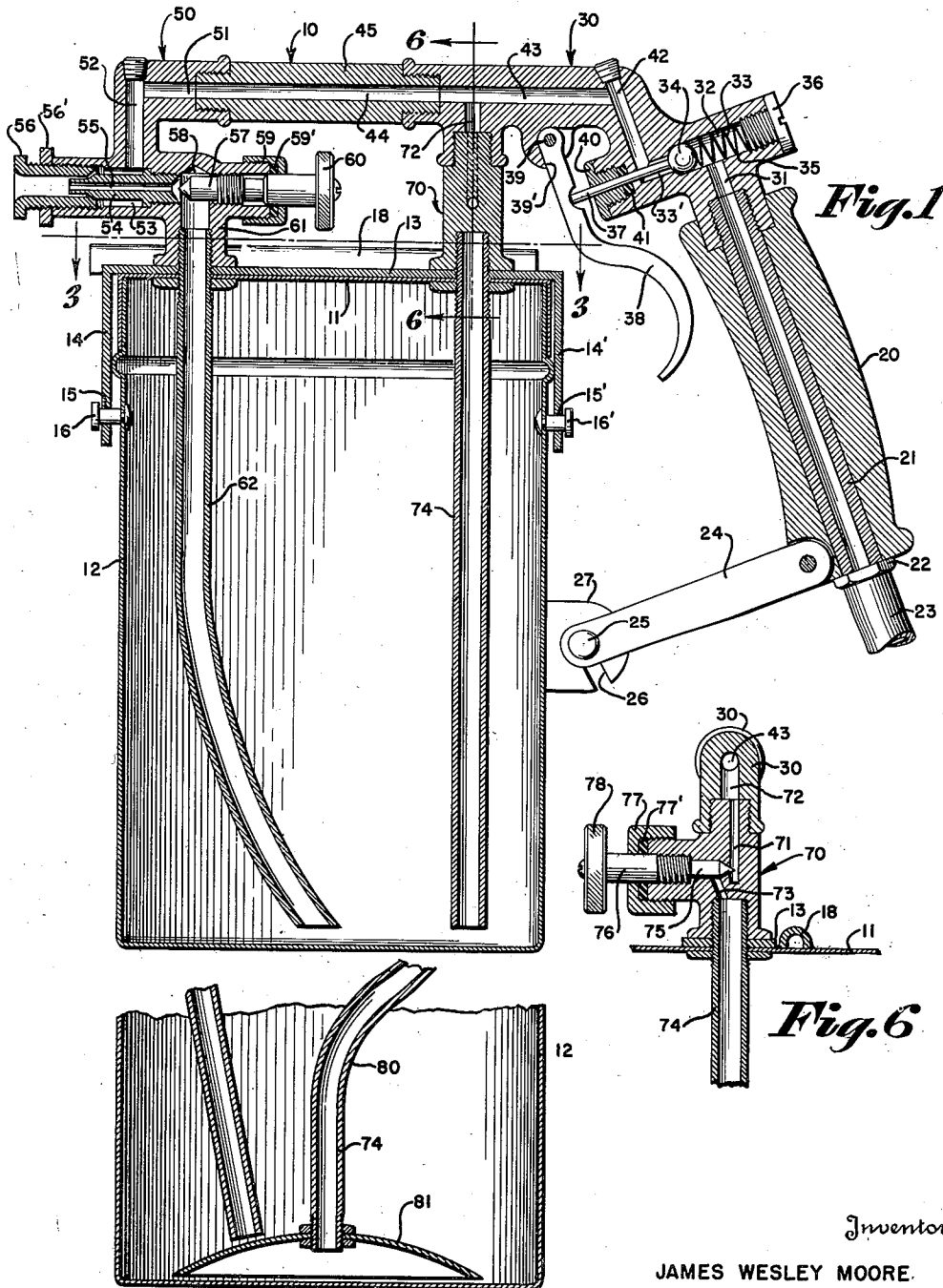


Fig. 7

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2 SHEETS—SHEET 2

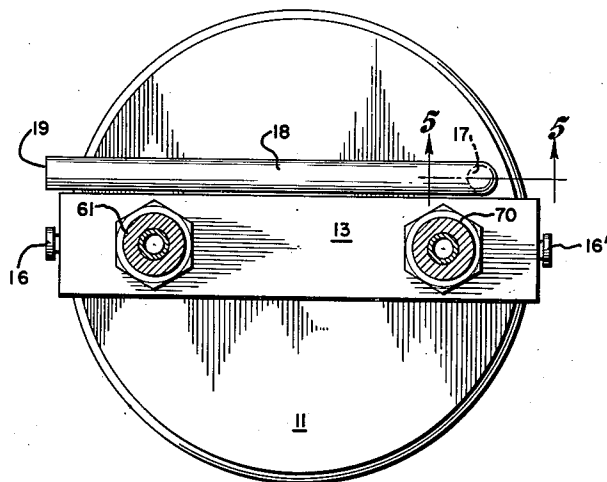


Fig. 3

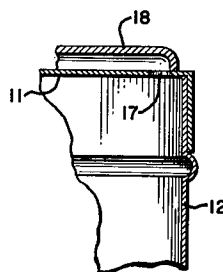


Fig. 5

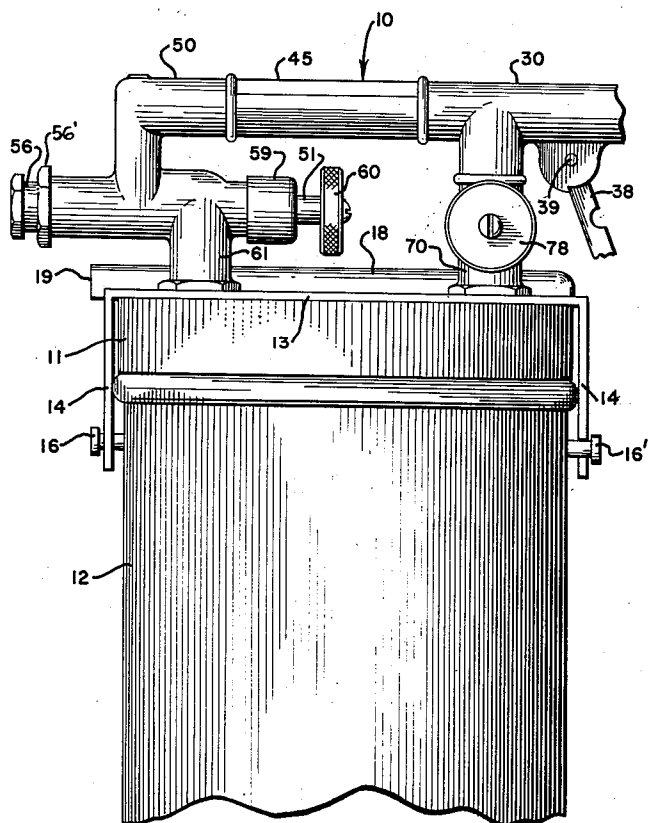
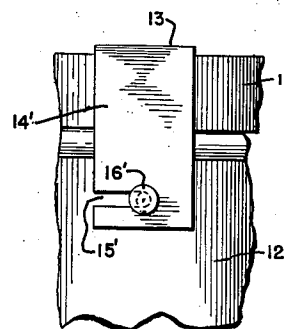


Fig. 2

Fig. 4



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UNITED STATES PATENT OFFICE

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SPRAYING DEVICE

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1 Claim. (Cl. 299—86)

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The present invention relates in general to spray devices or guns, and more particularly to spray guns adapted to spray heavy plastics, cement, plaster and the like material onto a desired surface.

Various spraying or atomizer devices operating on the aspirator or Venturi spray principle have been employed for applying liquids of densities approximating that of water, such as paint, washes, disinfectants, and other chemicals, to desired surfaces by drawing the liquids from a container by means of a partial vacuum and directing the liquid, mixed with a desired quantity of air, through a discharge nozzle. Such prior art devices have, however, been found to be inoperative to produce a spray of liquids or semi-solids of high density or viscosity, such as heavy plastics, cement, plaster and the like, the prior art spray devices being inadequate to produce a sufficiently high vacuum to draw the material into the nozzle in sufficient quantity unless the ingredients of the material are agitated so as to hold such ingredients in suspension and sufficiently mixed to maintain the viscosity at such a level that it can be sprayed with the desired uniformity of distribution or consistency.

Accordingly, an object of the present invention is the provision of a novel spray gun capable of producing a discharge spray of liquids and semi-solids of densities substantially greater than that of water, as well as of the lighter density liquids.

Another object of the present invention is the provision of a novel spray gun capable of producing a discharge spray of heavy liquid and semi-solid materials while maintaining the material in a continuous state of agitation during spraying operations by diverting a portion of the air stream through the mixture sufficient to keep the material in a state of suspension and insuring a constant mixture of the ingredients thereof and having a spill-proof air vent so that the spray may be directed from any angle without spilling the contents of the reservoir.

Another object of the present invention is the provision of a novel spray gun operating on the aspirator or Venturi principle capable of producing sufficiently high vacuums to insure the constant injection of heavy liquid and semi-solid materials desired to be sprayed into the air stream to generate a spray of desired uniformity of distribution and consistency.

Other objects, advantages and capabilities of the invention will become apparent from the following description, taken in conjunction with the accompanying drawings showing only preferred embodiments of the invention, in which:

Figure 1 is a longitudinal vertical section of the spray gun embodying the present invention;

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Figure 2 is a side elevation of a portion of the spray gun;

Figure 3 is a sectional view taken along the lines 3—3 of Figure 1, showing a plan view of the material container;

Figure 4 is a side elevation of a portion of the material container and the locking strap for the top thereof;

Figure 5 is a sectional view taken along the lines 5—5 of Figure 3;

Figure 6 is a vertical sectional view taken along the lines 6—6 of Figure 1; and,

Figure 7 is a vertical section of the lower portion of the material container and a modified form of agitation device.

The invention in general comprises an aspirator head mounted on a closed material container, the aspirator head defining an air passage therein with a Venturi throat and discharge nozzle at the forward end of the air passage, a suction tube communicating the material within the container to the Venturi throat, manually operable means controlling a supply of compressed air to the rear of the air passage, and means coupling a selected portion of the air supplied the air passage into the container and injecting the air into the material within the container near the bottom of the container to maintain the material in a constant state of agitation sufficient to insure suspension and constant mixture of the ingredients of the material, the Venturi throat being operative when air is forced therethrough to create a sufficient vacuum to draw the material from the container into the air stream and discharge the mixture through the discharge nozzle.

The invention will be more clearly understood from the following detail description of the embodiment shown in the drawings, in which like reference characters designate corresponding parts throughout. Referring particularly to Figures 1, 2 and 3, an aspirator or spray head, generally designated at 10, is mounted on the top 11 of a material container or tank 12. The container 12 may be of any desired size or shape, with the top 11 of the container 12 detachable therefrom and carrying all of the operative components of the spray gun. The top 11 is of slightly greater diameter than that of the container 12, so the rim of the top 11 can readily fit over the lip of the container, the top 11 being provided with a securing or locking strap 13, having downwardly depending tabs 14, 14' extending down the sides of the container 12 and provided with horizontally disposed slots 15, 15' near the lower ends thereof adapted to receive headed fastening lugs 16, 16' mounted on the sides of the container 12 on clockwise rotation of the top 11, in the embodiment shown. This locking means for the container top 11 is provided to

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facilitate rapid and simple removal of the top 11 from the container 12 when refilling of the container 12 is required. The container top 11 is likewise provided with a vent 17 positioned near the rear of the container top 11 and opening into a tube 18 extending forwardly along the surface of the container top 11, the tube 18 being open at its forward end as at 19. The vent 17 and tube 18 are provided to permit escape of air introduced into the container 12 to prevent pressure building up over the surface of the material in the container 12, the tube 18 serving as a standpipe preventing escape of the material in the container through the vent 17 when the spray gun is tilted upward, as in spraying a ceiling, and the positioning of the vent 17 toward the rear of the container top 11 preventing escape of the material therethrough when the spray gun is tilted downward, as in spraying the floor.

Compressed air from a convenient source is introduced into the aspirator head assembly 10 through the handle 20, the handle 20 being provided with a centrally located tube 21 terminating at its lower end with a threaded nipple 22 adapted to be coupled to the end of a compressed air hose 23. The handle 20 has pivotally mounted thereon at its lower end an interlocking brace member 24 pivoted for movement in a vertical plane, the free end of the brace member 24 having a lug 25 thereon adapted to be received into a downwardly disposed slot 26 defined in a bracket 27 mounted on the side of the container 12. The brace member 24 is provided to more rigidly secure the handle 20 and aspirator head assembly 10 to the container 12 when coupled with the bracket 27, but permit the container 12 to be readily detached from the aspirator assembly 10 and handle 20 when required.

The upper end of the handle 20 and tube 21 is coupled to trigger valve assembly 30. The trigger valve assembly 30 is provided with a bore 31 communicating with the bore of tube 21 in handle 20, the bore 31 communicating at its other end with a bore 32 directed at substantially right angles thereto and having portions 33 and 33' of different diameters, the portion 33 providing a valve seat at its junction with the smaller diameter portion 33' for a ball check valve 34 and housing a coil spring 35 abutting at one end against the ball check valve 34 and at the other end against the inner surface of a machine screw plug 36 threaded into the rear of the bore 33 to close the same. A valve plunger 37 is slidably mounted within the trigger valve assembly housing 30, one end of the plunger 37 extending through the smaller portion 33' of the bore 32 and abutting against the ball check valve 34 to move the same against the force of the coil spring 35 and away from the valve seat, the other end of the plunger 37 extending outwardly of the housing 30 and engaging a trigger 38 pivoted to housing 30 at 39, the pivotal mount 39 for the trigger 38 having a stop shoulder 39' to limit outward movement of trigger 38. The plunger 37 is lead out of the housing 30 through a screw plug 40 and packing washer 41 to prevent escape of compressed air through the guide slot for the plunger 37.

Compressed air entering the portion 33' of the bore 32 through the check valve 34 is conducted through bores 42 and 43 of the trigger valve assembly housing 30, and bore 44 in threaded tubular connector 45, to the nozzle assembly housing 50, housing the Venturi throat and nozzle head.

The nozzle assembly housing 50 is provided with a bore 51 communicating with the bore 44

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in connector 45 when the latter is threaded onto the housing assembly 50, and bore 52 connected to bore 51 and extending substantially at right angles thereto, to convey the air entering through the check valve 34 to chamber 53 surrounding a nozzle 54 and forming a Venturi throat therewith. The nozzle 54 is formed with a narrow bore 55 extending longitudinally therein, the forward end of which extends into a discharge nozzle 56 threaded into the front of the housing assembly 50, the bore of the nozzle 56 flaring outwardly in conical shape substantially conforming to the shape of the forward end of the nozzle 54 to form an extremely small opening surrounding the nozzle 54 from the chamber 53 to the nozzle 56 to produce a high vacuum in the bore 55 of the nozzle 54 through Venturi action. Discharge nozzle 56 is adjustable so the efficiency of the aspirator may be varied in accordance with the viscosity of the material being sprayed and locking nut 56' is provided to lock the adjustment after it is made. If preferred, discharge nozzle 56 may be mounted with a coil spring interposed between the housing and the nozzle so adjustments can be quickly made.

The rearward end of the nozzle 54 is tapered inwardly to form a seat for needle valve stem 57 extending into bore 58 in housing assembly 50 communicating with the bore 55 of the nozzle 54, the needle valve stem 57 being threaded into the housing assembly 50 and extending outwardly thereof through a threaded cap 59 and packing washer 59' to a knurled knob 60 mounted on the end thereof to permit manual adjustment of valve stem 57 and the opening of the bore 55 of nozzle 54. The bore 58 extends through the portion 61 of the housing assembly 50 which is secured to the container top 11, and is threaded to receive the end of a suction tube 62 extending through the container top 11 and into the container 12 to a point near the bottom of the container 12. By adjustment of the needle valve stem 57, the entrance aperture of the bore 55 of nozzle 54 presented to the material drawn through the suction tube 62 may be varied in accordance with the desired quantity of material introduced into the spray, the density of the material, and the flow of the material through the nozzle 54.

Referring now particularly to Figures 1 and 6, means are provided to effect continuous agitation of the material within the container 12 during spraying operation, to maintain the material in suspension and insure constant mixture of the ingredients thereof. This means comprises a member 70, threaded at its upper end into the trigger valve housing assembly 30, and secured at its other end to the container top 11. A bore 71 extending through the upper end of the member 70 is provided, communicating with a bore 72 in the assembly housing 30 connected with the bore 43. A bore 73 laterally spaced from the bore 71 and extending through the lower end of the member 70 is also provided, communicating with a tube 74 threaded into the member 70 and extending through the container top 11 and into the container 12 with its open end positioned near the bottom of the container 12. A horizontally disposed chamber of conical shape forming a valve seat connects the bores 71 and 73, the needle valve stem 75 extending into the conical connecting chamber and having a threaded shaft 76 extending out of the member 70 through cap 77 and packing washer 77' with a knurled knob 78 on the end thereof to

permit manual adjustment of the opening defined between the bores 71 and 73 and thus the quality of air tapped out of the air passage defined by bore 43, through the tube 74 and into the container 12.

In operation, pivoting the trigger 38 toward the handle 20 slides the plunger 37 inwardly, displacing the ball check valve 34 away from the valve seat against the force of the coil spring 35 and permitting compressed air conveyed through the hose 23 and tube 21 to pass through the valve seat at 34, bore 33' and bores 42 and 43 in trigger valve assembly housing 30, bore 44 in tubular connector 45, and bores 51 and 52 in nozzle assembly housing 50 to the channel 53 therein. This air is forced through the opening defined between the tapered forward end of nozzle 54 and rear end of nozzle 56 at a very high speed, creating at the mouth of the bore 55 of nozzle 54 a high vacuum through Venturi action, drawing a quantity of the material in the container 12, determined by the manual adjustment of the needle valve 57, up through the suction pipe 62 and through the bore 55 of nozzle 54 into discharge nozzle 56, creating a projected spray of the material forward of the discharge nozzle 56. At the same time, a portion of the compressed air passing through bore 43 is tapped off through bore 72 in trigger valve assembly housing 30, bores 71 and 73 in member 70 and the interconnecting conical valve seat forming the channel between the bores 71 and 73, and tube 74, and is dispersed through the material within the container 12 from near the bottom of the container 12 to maintain the material in a continuous state of agitation. The needle valve 75 disposed between the bores 71 and 73 permits manual control of the quantity of compressed air tapped off and injected into the material in the container 12 in accordance with the material used.

To insure more uniform distribution of the air tapped off from the air passage and through tube 74 into the material in the container 12, the modification shown in Figure 7 may be provided, consisting in bending the tube 74, as at 80, to bring the lower opening of the tube 74 near the bottom of the container 12 and aligned with the center axis of the container 12, and securing by suitable means a dome shaped deflector 81 to the lower end of the tube, the deflector 81 serving to spread the air injected through tube 74 out to the region near the lower corners of the container 12 and evenly inject the air into the material over a large area.

To review the operation of the spray gun, it is first connected with a suitable source of compressed air; and, if the material being sprayed is one of high viscosity such as a mixture of water proofing cement, valve wheel 78 is adjusted to provide considerable agitation of the material. As a heavy material is being used, the first adjustment on valve wheel 60 should be wide open and then if it is found that there is an overload of material it can be readjusted. Discharge nozzle 56 is likewise adjusted for the highest possible vacuum, namely screwed in almost to the shoulder of the conveyor nozzle, to raise the heavy liquid and it is then locked in the position found to be the most suitable. With these adjustments made, it is only necessary for the operator to press the air control valve trigger 38 during the

spraying operation. When a low viscosity homogeneous liquid is being used valve wheel 78 is adjusted so that no agitation takes place, valve wheel 60 is adjusted to a nearly closed position and discharge nozzle 56 is adjusted to pull very gently, so that the resulting spray will be so fine it will be like a fog. Thus, it will be seen that the spray gun can be adjusted for spraying liquids of varying degrees of viscosity.

Various modifications may be made in the invention without departing from the spirit and scope thereof, and it is desired, therefore, that only such limitations shall be placed thereon as are imposed by the prior art and are set forth in the appended claim.

What is claimed is:

In a spray gun for the spraying of heavy plastics and the like comprising, an aspirator head assembly provided with an air passage, a conveyor nozzle and a discharge nozzle substantially coaxially disposed within said air passage to form a Venturi throat therein, a material container associated with said aspirator head assembly and having an escape vent therein, a suction tube coupled between said conveyor nozzle and said container to draw material in said container through said conveyor nozzle when a stream of air is directed through said air passage, means supplying compressed air to said air passage, a trigger actuated check valve disposed in said air passage operative to control the flow of air there-through, and means having a manually controllable valve therein for coupling a selected portion of the air in said air passage into said container and injecting said air into said material near the bottom of said container to maintain the material in a state of agitation, said escape vent being of a size to completely relieve pressure on the surface of said material from the air injected therein to render aspiration of said material solely under control of flow of air through said Venturi throat, and said escape vent being coupled to tubular means extending along the top of said container and forwardly therealong, said tubular means forming a standpipe for said escape vent to prevent escape of material from within said container through said escape vent throughout any normal orientations of the spray gun in use.

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