May 9, 1967 O. RHODES 3,318,530

MATERIAL DISCHARGE GUN

Filed Aug. 24, 1964

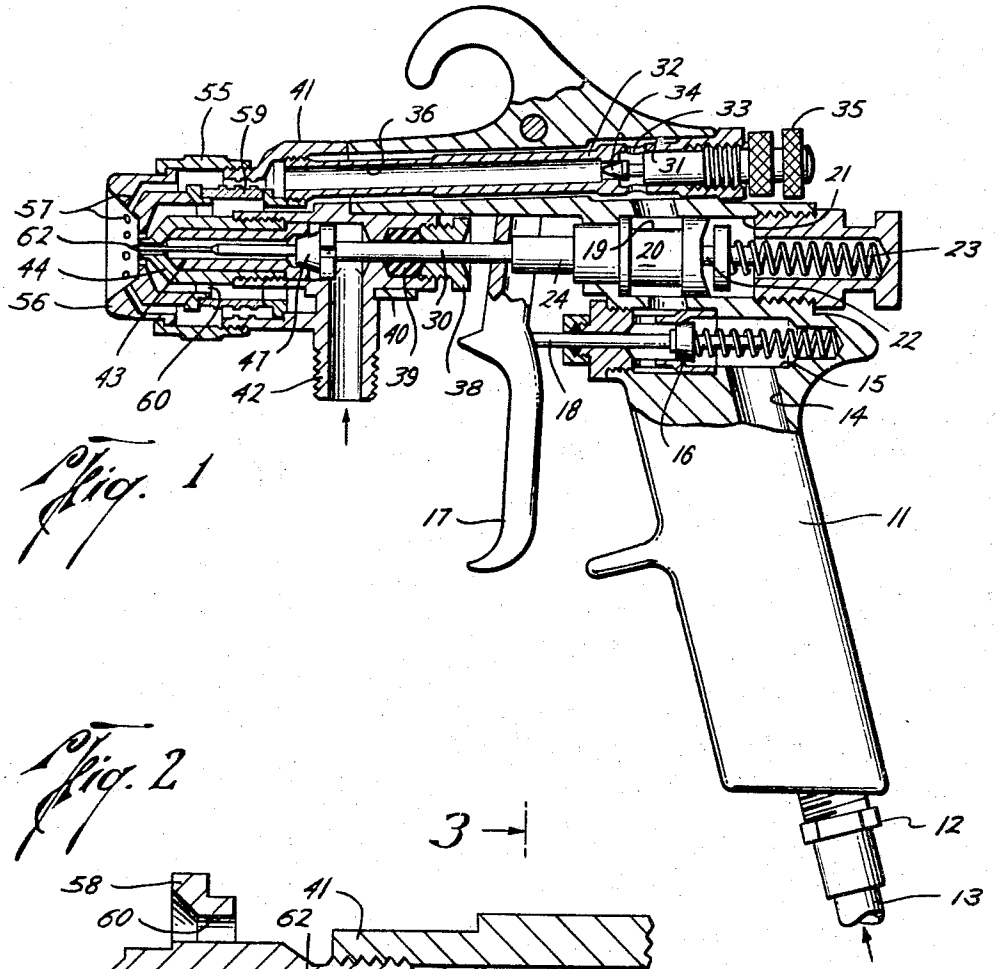
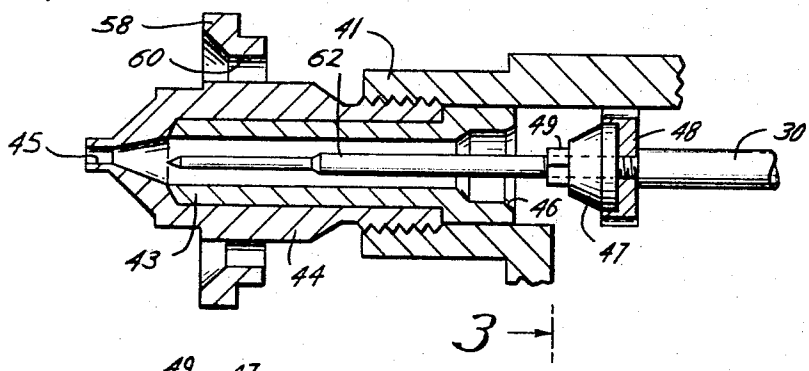


Fig. 1

Fig. 2



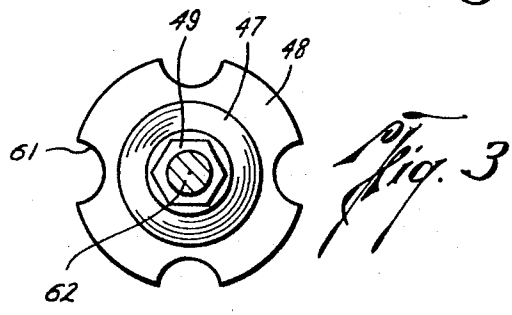


Fig. 3

Omer Rhodes
INVENTOR.

BY Harris, Larkin and Medlock
ATTORNEYS

United States Patent Office 3,318,530 Patented May 9, 1967

3,318,530

MATERIAL DISCHARGE GUN

Omer Rhodes, Houston, Tex., assignor to Clemtex Ltd., Houston, Tex., a limited partnership

Filed Aug. 24, 1964, Ser. No. 391,720
1 Claim. (Cl. 239—117)

This invention relates to a pneumatic gun for discharging materials of a semi-fluid nature and more particularly to air brushes of the type adapted for spraying coating materials such as metallic coatings of the type such as zinc coatings. These coatings act as sacrificial protective coatings for steel and this process is sometimes referred to as cold galvanizing.

One of the problems associated with the operation of this type of spray gun is that material being sprayed will quite often build up as a residue on the surface of the gun adjacent to the orifice which emits the material to the atmosphere. This build up of material not only distorts the volume of material being emitted or ejected from the gun but can also be of such extent that when it is desired to terminate operation of the gun, the material will continue to flow from the opening causing great economic loss. This is usually caused by the material build up fouling or otherwise rendering inoperable the valve structure which ordinarily closes off the flow of the material. Moreover, the type of material which is contemplated for use with respect to the instant invention will normally cause severe abrading and thereby render some guns inoperable in a very short time.

The prior art is replete with examples of various gun devices which have been developed and which have one or more of the aforesaid deficiencies. Many of the prior art guns have needle valves which are designed to seal and close off the emitting orifice. However, these needle valves are particularly susceptible to the aforesaid fouling. Other prior art devices have utilized certain flexible butt type valves but they are likewise adversely affected by the build up of residue of the spray material on the surfaces and valve seats thereof.

Moreover, the straight hydraulic guns of the prior art are not satisfactory for spraying the metallic coatings such as zinc coatings because the extremely high pressures at which these type of guns operate causes the zinc or other metal to separate out from the carrier.

It is therefore an objective of the instant invention to provide an improved pneumatic spray gun wherein the aforesaid deficiencies are overcome with a minimum of maintenance problems.

Examples of prior art patents which reflect the general state of the art include the following U.S. Patents: 1,969,205, 2,577,437, Re. 19,907, 1,321,014, 2,457,993, 2,105,903, 2,584,943, 1,081,102, 1,736,356.

Briefly stated, the instant invention is a pneumatic spray gun for spraying a coating material, which spray gun has what will be described as a gun body. This gun body is provided with a nozzle end and at least one passage through the body for receiving a pressurized gas such as air, and for discharging the gas in a predetermined pattern out the nozzle end.

Inlet means are connected to the gun body for receiving the coating material under pressure, normally in the range of about fifteen pounds to fifty pounds per square inch. A cylinder is connected to this inlet means for receiving the coating material. One end, i.e., the forward end, of the cylinder has a portion with a reduced diameter, which end is mounted for emitting the material to the atmosphere and through the gas pattern. The other end of the cylinder is provided with a frusto conical shaped valve seat. A frusto conical shaped valve of resilient material such as rubber is supported adjacent to the valve seat and adapted for seating therein in a closing relationship. This valve is mounted on a valve stem, which stem is axially aligned with the central axis of the cylinder. There is also provided means for moving the valve and valve stem axially with respect to the valve seat whereby said valve is moved to and from a closed position.

Biasing means are also provided for normally urging the valve and valve stem to a closed position when the gun is not being operated. The fore end or front end of the valve stem is providing with an extension needle which projects forwardly in the cylinder and has a point which is adapted to move in and out of the reduced end of the cylinder in a loose fitting relationship during opening and closing of the valve. Hence, the diameter of the tip of the pin is smaller than the diameter of the reduced end of the cylinder which forms the emitting orifice. The purpose of this needle is to maintain an opening through this emitting orifice despite a certain amount of residual build up of spray material, and also prevents excessive build up in the orifice.

Reference to the drawings will further explain the invention, wherein:

FIG. 1 is a side elevation view generally in central section of one embodiment of the instant invention.

FIG. 2 is an enlarged fragmentary view of a portion of the cylinder and valve arrangement of the instant invention.

FIG. 3 is a view taken at line 3—3 of FIG. 2 showing the mounting of the valve in relation to the valve stem.

Referring to FIG. 1, one embodiment of the instant invention will be explained in detail. There it will be seen that gun body **11** is provided with air inlet means in the form of air inlet nipple **12** connected to air tube **13** which is, of course, connected to a suitable supply of pressurized air, or gas, which will be used for the spraying operation. Nipple **12** communicates with air duct **14** which leads up through the handle of gun body **11** to lower cylinder **15**. Cylinder **15** has spring biased air valve **16** mounted therein and which is actuated by the operation of trigger **17** operating against valve rod **18** working through appropriate packing. When valve **16** is unseated air is supplied through appropriate channels communicating with the annular space **19** which surrounds gasket housing **20** which is mounted in middle cylinder **21**.

Gasket housing **20** supports plunger **22** therein which is normally biased to the left as viewed in FIG. 1 by spring **23**. Plunger **22** connects through gasket housing **20** to piston **24** which in turn is connected to valve rod **30**. Piston **24** is engaged by trigger **17** when trigger **17** is moved rearwardly.

Air is then supplied upwardly to upper cylinder **31** through appropriate conduits. Mounted inside of upper cylinder **31** is air control sleeve **32** which forms two channels to the nozzle end of the gun as will now be explained.

Sleeve **32** is provided with a plurality of small ports **33** which communicate with the internal chamber **36** which extends forward through sleeve **32**. The passage of air through chamber **36** is controlled by needle valve **34** which in turn is adjusted by dial **35** mounted on the back side of gun body **11**. Air is thus admitted to internal chamber **36** of sleeve **32**. The front end of sleeve **32** is threadably connected to spray head **41**, the details of which will now be explained.

While spray head **41** will be described as being unitary, it is to be understood that it could be made of a plurality of parts operably connected together. The lower end of spray head **41** is provided with material inlet means in the form of tube **42** which projects downwardly from the gun. Tube **42** communicates with cylinder **43** which is in the form of a sleeve with a cylindrical open-

ing therein which is generally axially aligned with valve rod **30**. Valve rod **30** passes through a rearwardly extending portion of spray head **41** which is held in a ring **40**, which is attached to and forms a part of gun body **11**. This rearwardly extending portion of spray head **41** supports packing **39** and packing nut **38** through which valve rod **30** moves.

The fore end of the cylindrical opening in cylinder **43** has a reduced area formed by fluid tip **44** which is threadably secured to spray head **41** as best seen in FIG. 2. There it will be observed that cylinder **43** is unobstructed and that fluid is emitted out orifice **45** formed in the forward end of fluid tip **44**. Hence, it may be said that orifice **45** has a diameter less than the diameter of cylinder **43**. The other end, i.e., the rearwardly end, of cylinder **43** is provided with a frusto conical shaped valve seat **46** which is generally concentric with the central axis of cylinder **43**. It is an important feature of this invention that valve seat **46** is frusto conical in shape as will be explained hereinafter.

Mounted on valve rod **30** and held adjacent to valve seat **46** is a frusto conical shaped resilient valve **47** which may be made of rubber or the like. Valve **47** is held in position by valve retainer washer **48** on the back side thereof and lock washer **49** on the front or leading side thereof. One important feature of the present invention is that the frusto conical section of valve **47** is generally of a longer axial length than the axial length of valve seat **46**. Hence, valve **47** has a relatively large seating area for contacting and closing with valve seat **46**. The beveled surface or frusto conical shape of valve seat **46** also permits the flow of fluid there past which helps to cleanse the valve seat area and reduces the amount of material residue build up thereon. In addition, since valve **47** is of a resilient material, it will easily conform to the surface of a valve seat **46** even if there is a slight material build up thereon. Further, the fact that the axial length of the frusto conical section of valve **47** is longer than the axial length of valve seat **46** allows both for any wear on valve **47** and any undesirable build up of residual spray material on valve seat **46**. These are some of the important features of the invention and which provide a positive closing action under normal operating conditions when spraying metallic base coatings.

Normally, valve **47** will be biased to the closed position and seated against valve seat **46** by operation of spring **23** acting on plunger **22**, piston **24** and rod **30** when the tool is not in operation as is shown in FIG. 1.

Spray head **41** has threadably attached around the end thereof retainer ring **55** which is adapted to secure and hold in place air cap **56** having air discharge orifices **57** which are for projecting air therefrom in a predetermined pattern. In addition, fluid tip **44** has an annular flange **58** which secures annular sleeve **59** in position. Sleeve **59** has spaced thereabout annular baffle rings which help to disperse the air to all of the orifices **57**. Sleeve **59** also forms on the inside thereof an annular chamber which communicates with upper cylinder **31** and provides pressurized air through an air orifice in air cap **56**, which air orifice surrounds the forward end of fluid tip **44** which forms fluid orifice **45**.

In operation of the gun, and starting from the closed or inoperative position, material to be sprayed is supplied through tube **42** under the desired pressure, usually in the range of fifteen pounds to fifty pounds per square inch. In addition, pressurized air is applied through air tube **13** to cylinder **15**. Upon actuation of trigger **17** air is simultaneously applied upwardly for passage through chamber **36** of sleeve **32** and then out of orifices **57**. At the same time air is applied along the surface of upper cylinder **31** to the chamber surrounding fluid tip **44**, through axial openings **60** provided in flange **58**, and then outwardly around the forward end of fluid tip **44** and past orifice **45**, thereby forming another air pattern for atomizing and dispersing the coating material.

As trigger **17** is moved rearwardly it also moves piston **24** and valve rod **30** rearwardly thereby unseating valve **47**. At this point the pressurized material will flow upwardly through tube **42**, past washer **48**, and through peripheral notches **61** provided therein. As the material is forced out orifice **45** under pressure, it will contact the air patterns established by the air being discharged from the nozzle end of the gun and thereby projected to the desired spray pattern.

It will be observed that the forward end of rod **30** has attached thereto needle **62**, the tip of which is of a smaller diameter than orifice **45**, and hence fits therein in a loose fitting arrangement. When the spray gun is not in operation, valve **47** is seated in valve seat **46**. Upon actuation of trigger **17**, needle **62** is withdrawn from orifice **45** at the same time that valve **47** is unseated. The purpose of needle **62** is to prevent stop-up of orifice **45** by residual spray material during close down or non-operation of the tool. Needle **62** is supported on rod **30** such that cylinder **43** is maintained in an unobstructed condition so that spray material may easily flow therethrough.

The instant invention provides many advantages over the prior art. For example, a spray gun constructed according to the present invention has operated for a long period of time with few maintenance problems, whereas a prior art gun heretofore used for this purpose without the novel elements of the present invention was susceptible to malfunctioning after a short period of operation. For example, the gun of the instant invention has sprayed in excess of 800 gallons of a coating material, such as zinc spray coating, without failure or malfunctioning, whereas the use of a similar gun without the novel elements of this invention sprayed only five gallons before shut down, disassembly, and cleaning of the gun was required. In the case of this prior art gun, the build up of residue material in the valve structure prevented the cut off of the flow of the spray material during non-operation. Hence, there was great loss of material from the gun when not spraying. In addition, there was much loss of time in disassembling the gun to correct this malfunctioning.

One advantage of the instant invention is that the novel shape and arrangement of resilient valve **47** in relation to valve seat **46** provides a very positive closing of the fluid material flow. In addition, the resiliency of valve **47** accommodates any slight build up which may occur on valve seat **46**. Moreover, build up of residual spray material on valve seat **46** is reduced because of the tapered or frusto conical shape of seat **46**. It is thought that the fluid flow through, along, and past the beveled surface of valve seat **46** assists in cleaning therefrom the material that may build thereon. In addition, needle **62** projects into orifice **45** during non-operation of the tool to prevent the hardening of any residue of spray material therein. Hence, when operations are resumed with the gun, an immediate opening is provided through orifice **45**. This is more than a cleaning action on the part of needle **62** in that it also provides a continuous opening through orifice **45** upon removal of needle **62** therefrom. Depending upon the particular material being sprayed, orifice **45** will generally have a diameter of at least $^{7}/_{1000}$ of an inch or larger.

For purposes of convenience, gun body **11** and spray head **41**, together will sometimes be referred to as a gun body generally.

Further, for purposes of convenience cylinder **43** and fluid tip **44** may sometimes be referred to together as a cylinder for receiving the coating material to be sprayed. In this connection, and as explained above, spray head **41** and associated elements may be unitary or a plurality of parts which when assembled, assume the form of the invention described. Hence, in some instances, prior art guns may be converted to guns which embody the instant invention by use of a conversion kit having the necessary

elements and adaptors for the spray gun of this invention.

Further modifications may be made in the invention as particularly described without departing from the scope of the invention. Accordingly, the foregoing description is to be construed illustratively only and is not to be construed as a limitation upon the invention as defined in the following claim.

What is claimed is:

A pneumatic spray gun for spraying a metallic coating material, the combination comprising:

a gun body having a nozzle end and at least one passage therethrough for receiving pressurized air and for discharging said air in a predetermined air pattern out said nozzle end,

inlet means connected to said gun body for receiving said coating material under pressure,

a cylinder forming an unobstructed chamber connected at a generally right angle to said inlet means for receiving said coating material, one end of said cylinder having a reduced diameter forming a discharge opening and mounted for emitting said material through said air pattern and the other end of said cylinder having a frusto conical shaped valve seat concentric with central axis of said cylinder and positioned substantially rearward of said discharge opening and adjacent said inlet means with the smallest diameter of said valve seat being at least twice the diameter of said discharge opening, whereby a given quantity of spray material will pass therethrough in the open position at a substantially lower velocity than through said discharge opening,

a frusto conical shaped valve of resilient material supported adjacent to said valve seat and for seating

therein in a closing relationship, the axial length of the frusto conical portion of said valve being of a greater length than the axial length of said valve seat,

said valve being mounted on a valve stem axially aligned with said cylinder,

means for moving said valve and valve stem axially with respect to said valve seat, whereby said valve is thereby opened and closed,

resilient biasing means for normally urging said valve and valve stem to a closed position when said gun is not being operated, and

an extension needle connected to the front end of said valve stem and projecting into said discharge opening in loose fitting relationship when said valve is in the closed position, whereby an opening is maintained through said discharge opening even during times when coating material residue tends to build up therein.

References Cited by the Examiner

UNITED STATES PATENTS

1,661,150	2/1928	Birkenmaier	239—117
2,172,193	9/1939	Downs	239—597
2,236,551	4/1941	Striegel	239—407
2,705,663	4/1955	Gilbreath	239—590.3
3,111,271	11/1963	Lofgren	239—117
3,198,435	8/1965	Ullman	239—117

M. HENSON WOOD, JR., *Primary Examiner.*

R. S. STROBEL, *Assistant Examiner.*