United States Patent

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[54] SPRAY NOZZLE ASSEMBLY OPERABLE AT LOW PRESSURE

7 Claims, 2 Drawing Figs.

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[51] Int. Cl. F23d 11/16
[50] Field of Search ..... 239/419.3, 419, 424.5, 427.3, 428, 596, 600, 406, 418, 427, 102, DIG. 20

[56] References Cited

UNITED STATES PATENTS

2,570,190	10/1951	Ballard	239/424.5 X
2,737,419	3/1956	Marcuse	239/428 X
2,991,015	7/1961	Standlick	239/428 X
3,330,484	7/1967	Johnson et al.	239/428 X
3,477,647	11/1969	Grundman et al.	239/600 X

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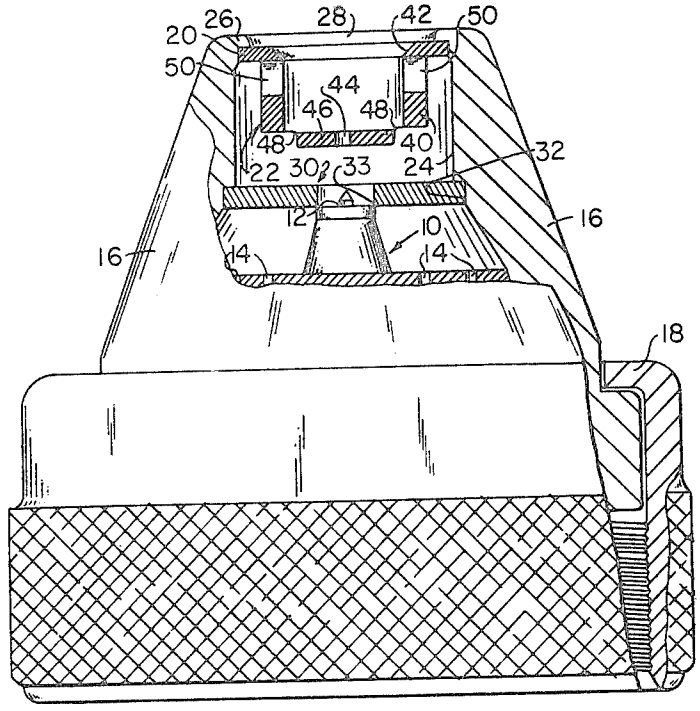
ABSTRACT: Paint sprayer with nozzle mounted in a chamber of an air cap adapted to be secured to a conventional compressed-air gun adjacent separate paint and air outlets therefrom.



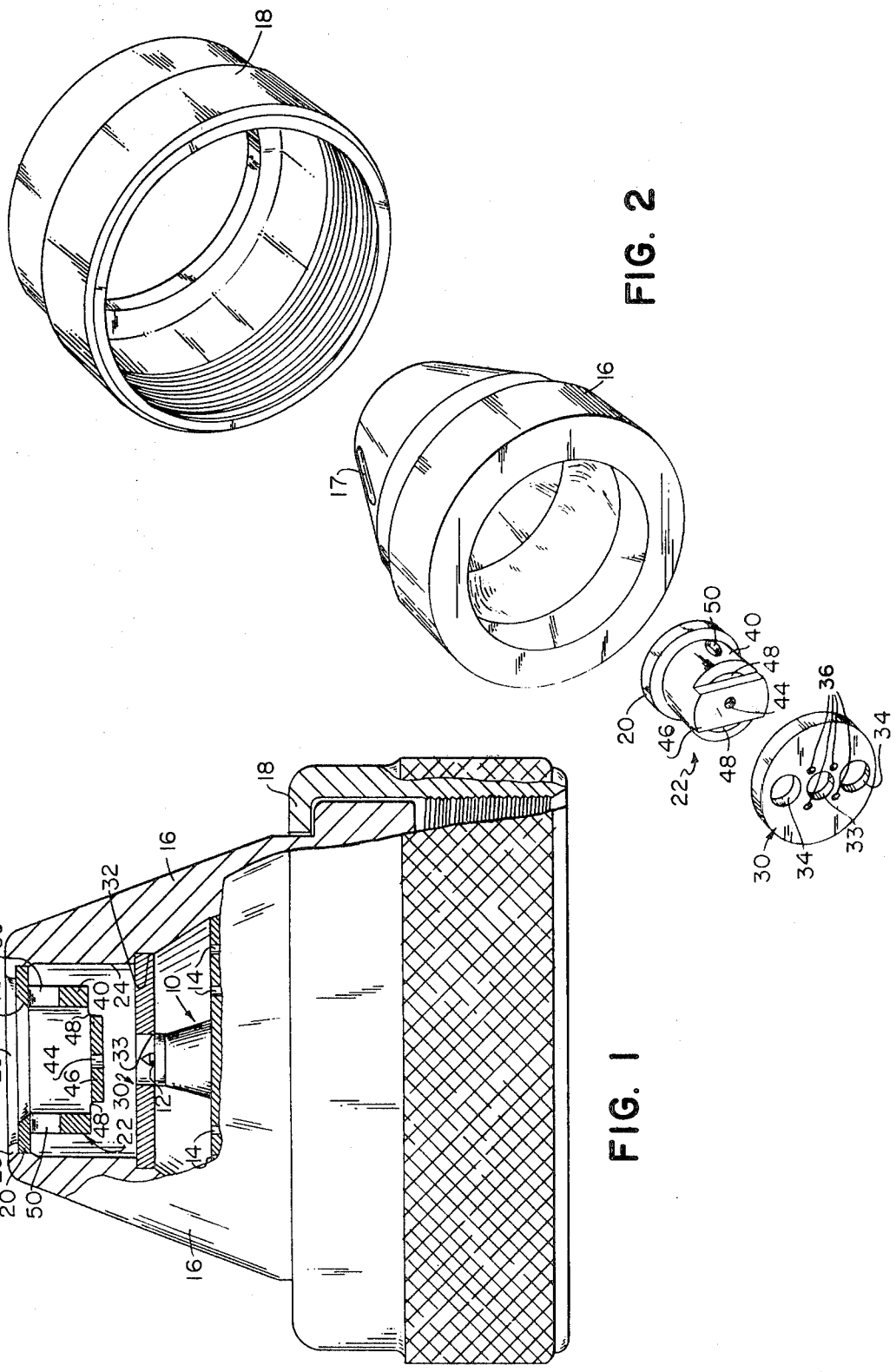

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FIG. 2

FIG. 1

SPRAY NOZZLE ASSEMBLY OPERABLE AT LOW PRESSURE

This invention relates to spraying paint.

Objects of the invention are to provide an improved paint sprayer capable of incorporating a conventional compressed-air paint-spraying gun, and in which even very heavy paint can be finely atomized, and yet which can be operated at low pressure and with low air consumption, and is simple, reliable, and inexpensive to make and use.

The invention features an air cap adapted to be secured to a conventional compressed-air paint-spraying gun adjacent separate paint and air outlets therefrom, the air cap having an outlet and a chamber upstream of the outlet for receiving air and paint from the gun, and an atomizing nozzle mounted in a chamber upstream of the air cap outlet, the nozzle having a body defining an axial flow passage with a pair of coaxial radial holes thereinto spaced 180° apart intermediate the inlet and outlet ends of the passage, so that paint and air entering the air cap pass into the nozzle at its inlet end and through its radial holes, and the paint emerges from the air cap outlet atomized in a spray. In preferred embodiments the nozzle has a single outlet opening and the air cap has an end wall defining a single outlet opening aligned with, and of larger diameter than, the nozzle outlet opening; the nozzle has a flange at its outlet end and is mounted in an axial passage in the air cap with the flange against the air cap end wall, the axial passage of the air cap being of larger diameter than the nozzle body just upstream of the flange; and a perforated reflector is mounted at the upstream end of the axial passage of the air cap and is spaced from the nozzle.

Other objects, features, and advantages of the invention will be apparent from the following description of a preferred embodiment thereof, taken together with the drawings thereof, in which:

FIG. 1 is a view of a conventional paint sprayer modified to embody the invention, with the air cap partly broken away, some of the elements inside the air cap being shown in section; and

FIG. 2 is an exploded perspective view of some of the elements of FIG. 1.

Conventional paint sprayer head **10**, with needle valve paint outlet **12** surrounded by air outlets **14**, is mounted inside air cap **16**, which is adapted to be secured to a conventional compressed-air-operated spray gun (not shown) by threaded retainer ring **18**. Cap **16** has an indicating groove **17** (FIG. 2).

Annular flange **20** of nozzle **22** is press fitted in the downstream end of axial bore **24** of cap **16**, against flange **26** surrounding cap outlet **28** (outlet diameter 0.370 inch).

Disc-shaped reflector **30** (outside diameter 0.496 inch) is press fitted in counterbore **32** of cap **16**, between nozzle **22** and head **10**. Reflector **30** has a central hole **33** (diameter 0.111 inch) midway between two holes **34** (each 0.144 in diameter having axes spaced 0.290 inch and coplanar with the axis of hole **32**. Central hole **33** is concentric with an imaginary circle (diameter 0.136 inch) containing the centers of four equally spaced holes **36** (diameter 0.135 inch) arranged symmetrically about the line of centers of holes **33** and **34**.

Nozzle **22** has a cylindrical wall **40** (outside diameter 0.346 inch, inside diameter 0.260 inch) open at its outlet end across 45° countersink **42**, which is surrounded by flange **20**. Axial inlet **44** (diameter 0.025 inch) is provided in upstream end wall **46** which is relieved to provide two openings **48** into the nozzle, each opening **48** having the shape of a segment of a circle. The centers of openings **48** are respectively spaced angularly 90° from the centers of holes **34**. Two opposing coaxial radial holes **50** (each of diameter 0.073 inch) through wall **40** are 180° apart and tangent to countersink **42**. The centers of inlet **44**, openings **48**, and holes **50** all lie in a single plane which is horizontal when the sprayer is oriented with groove **17** facing up (FIG. 2).

Additional nozzle dimensions are:

Length between downstream face of wall **46** and upstream end of countersink **42**	0.148"
Overall length of nozzle	0.209"
Depth of countersink **42**	0.029"
Width of wall **46** between openings **48**	0.190"
Diameter of bore **24** upstream of flange **20**	0.442"

In operation, paint, and air at greater than atmospheric pressure are supplied to head **10** (held so that groove **17** faces up) in conventional manner and respectively enter cap **16** through outlets **12** and **14**. The paint passes through hole **33** and most of the air passes through holes **34**. Holes **36** relieve by about 20 percent the hydraulic pressure drop across hole **33**, thus reducing the required paint pressure. Mixing takes place in bore, **24**, with paint and air in varying proportion passing into the nozzle through inlet **44**, openings **48**, and holes **50**. Nozzle **22** atomizes the paint, which emerges from outlet **28** in a vertical, fan-shaped spray of very small droplets, due to the arrangement of holes **50** in a single opposing pair (although the spray would still be fan-shaped if there were e.g., a pair of additional radial holes respectively spaced 90° from and smaller than holes **50**). Reflector **30** minimizes backspraying of paint against head **10**, improves atomization, and, by the arrangement of holes **34** spaced 90° respectively from holes **50** and openings **48**, increases the width of the fan.

In a typical operation, paint flow is **23** oz./min., and air flow is 15 c.f.m. at 60 p.s.i.g. Air consumption decreases as paint flow is increased.

The subject matter disclosed herein relating to spraying paint with an atomizing nozzle, to supplying the nozzle through a reflector, and to provision of a fan-shaped spray, was the sole invention of Nathaniel Hughes.

Other embodiments will occur to those skilled in the art and are within the following claims.

What we claim is:

1. Paint-spraying apparatus comprising an air cap adapted to be secured to a conventional compressed-air paint-spraying gun adjacent separate paint and air outlets therefrom, said air cap having
   - a portion defining an outlet, and
   - a chamber upstream of said air cap outlet for receiving air and paint from said separate outlets, and
   - an atomizing nozzle mounted in said chamber adjacent said air cap outlet and comprising a body defining
     - an axial flow passage having inlet and outlet ends, and
     - a pair of coaxial radial holes into said passage spaced 180° apart intermediate said ends,
   - said inlet end of said axial flow passage and said coaxial radial holes each being in communication with both said paint and air outlets, whereby said paint and air received in said chamber pass into said flow passage at said inlet end and through said radial holes, and emerge from said air cap outlet, said paint emerging atomized in a spray.

2. The apparatus of claim 1 wherein said air cap has an end wall defining a single outlet opening aligned with a single outlet opening of said nozzle.

3. The apparatus of claim 2 wherein said nozzle has a flange surrounding said nozzle outlet opening, and said nozzle is mounted with said flange against said end wall.

4. The apparatus of claim 2 wherein said outlet opening of said air cap is of diameter at least as great as that of said nozzle outlet opening.

5. The apparatus of claim 4 wherein said outlet opening of said air cap is of greater diameter than said nozzle outlet opening.

6. The apparatus of claim 3 wherein said chamber is an axial passage in said air cap of diameter greater than that of said nozzle body just upstream of said flange.

7. The apparatus of claim 1 wherein a perforated reflector is mounted in said air cap at the upstream of said chamber.