Dec. 12, 1950 D. J. PEEPS 2,533,953

SPRAY GUN

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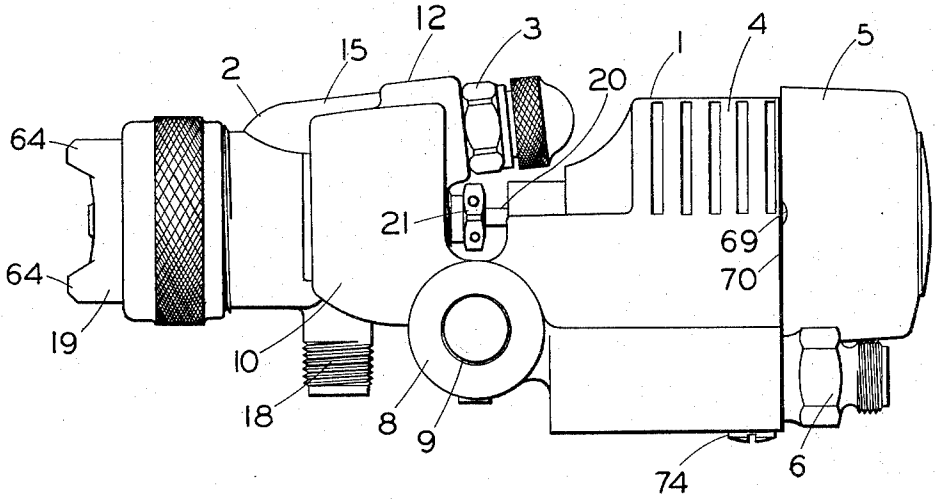


Fig. 1.

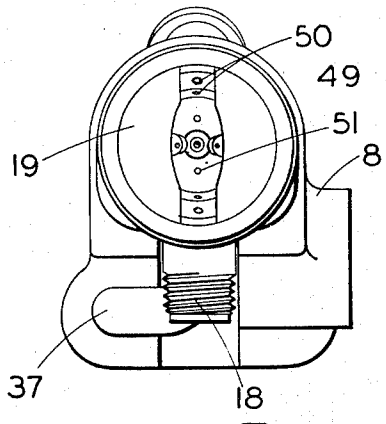


Fig. 2.

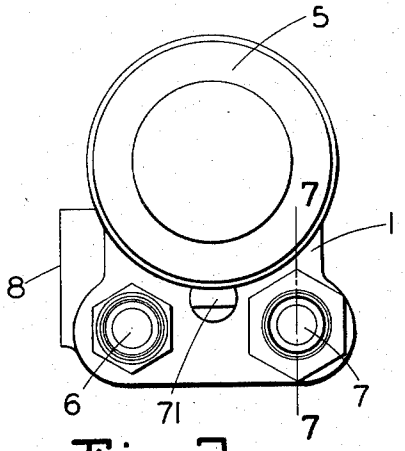


Fig. 3

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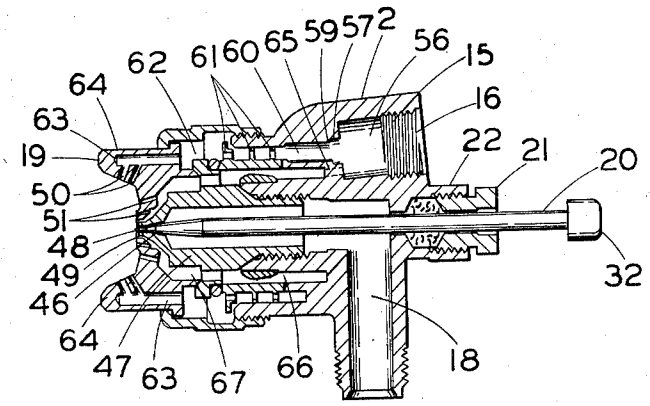


Fig. 4.

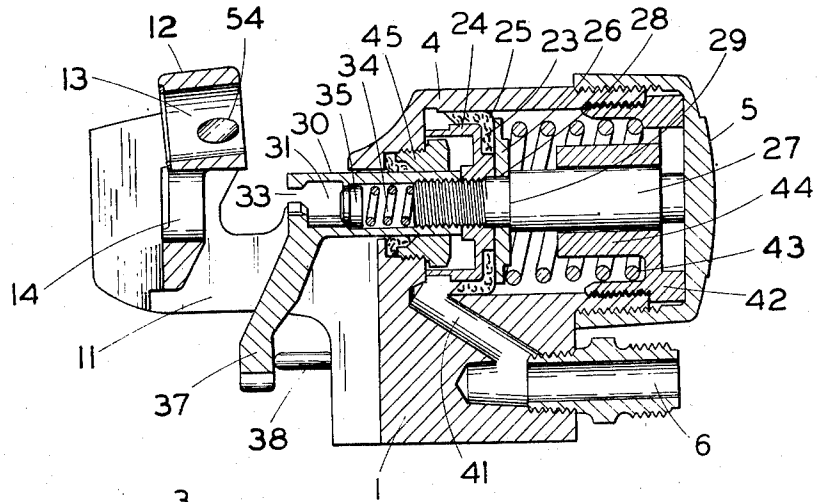


Fig. 5

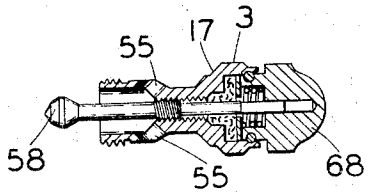


Fig. 6.

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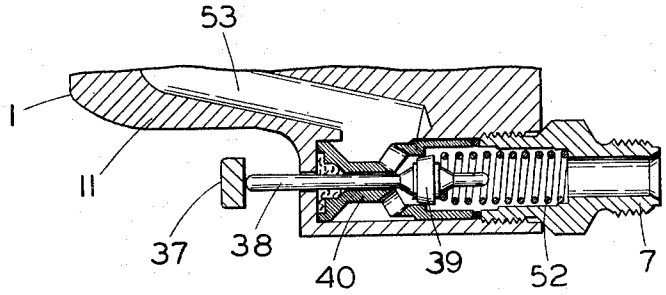


Fig. 7.

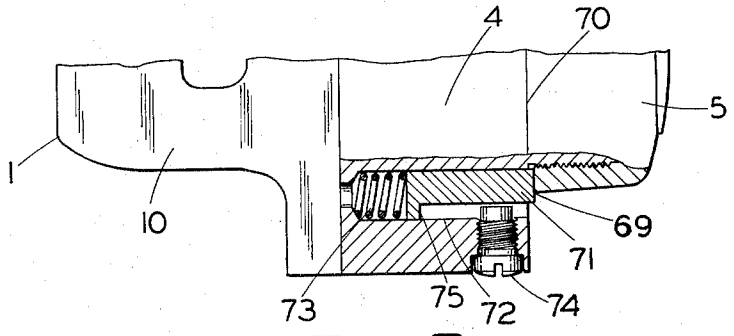


Fig. 8.

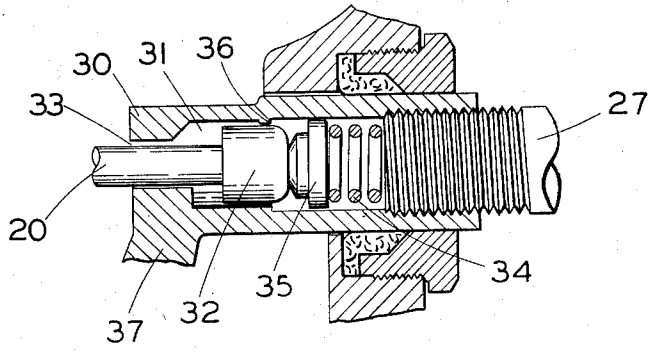


Fig. 9.

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UNITED STATES PATENT OFFICE

2,533,953

SPRAY GUN

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Application September 8, 1947, Serial No. 772,780

3 Claims. (Cl. 299—150)

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This invention relates to an automatic spray gun using air for the atomizing medium and for opening the needle valve controlling the discharge of spray material.

A primary object of the invention is the provision of a spray gun of a compact and sturdy design.

Another object of the invention is the provision of reliable guide and bearing means for the air piston.

Still another object is the provision of a substantial stopping member to check the rearward movement of the piston.

An additional object is the provision of an easily disengaged joint between the spray material valve and piston.

Other objects and purposes of the invention will become apparent upon a reading of the following specification considered with the accompanying drawing in which:

Figure 1 is a side elevational view of a spray gun embodying my invention;

Figure 2 is a front elevational view of the spray gun;

Figure 3 is a rear elevational view thereof;

Figure 4 is a vertical section of the spray head detached from the main body member of the gun;

Figure 5 is a vertical section of the body member without the spray head; in order to show the air inlet 6 and the communicating passage 41 the lower rearward portion of this section is along a plane inclined laterally to the left of Figure 3.

Figure 6 is a vertical section of the connector assembly for holding the spray head and body together. This includes the air valve for adjusting the air flow to horn ports on the spray head air cap;

Figure 7 is a fragmentary vertical section of a rear portion of the spray gun taken on the line 7—7 of Figure 3 through the atomizing air supply inlet and air valve housing;

Figure 8 is a side elevational view of a portion of the rear end of the spray gun showing in vertical section the locking mechanism for holding the adjustable cylinder cap in selected position; and

Figure 9 is a fragmentary vertical section of the connecting portions of the spray material needle valve and the air piston.

The spray gun shown in the drawing consists of a main body portion 1 and a spray head 2 held together by a hollow connecting screw 3. The body 1 has an air cylinder 4 closed by cap 5 at its rear end. Below the cap 5 are air inlets

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6 and 7 for supplying air respectively to the air cylinder and to the spray head. Through a boss 8 on the body is a threaded bore 9 for receiving a mounting rod (not shown) for supporting the spray gun in any desired location.

From the forward end of the air cylinder 1 extend two vertically flattened arms 10 and 11. Near their rear ends these arms are joined by a narrow transverse section 12 in which there are upper and lower bores 13 and 14. The rear end of the spray head 2 is held between the forward ends of the arms 10 and 11 with the rear end wall of air inlet 15 abutted against the forward end wall of the upper bore 13. The inlet 15 is internally threaded at 16. The connector 3 holds the spray head on the body 1 by being inserted through the bore 13 and engaging the threads 16. The connector 3 (Fig. 6) has a tapered shoulder 17 which seats around the rear end wall of the bore 13.

On the lower side of the spray head 2 is a spray material inlet connection 18. On the forward end of the spray head is an air atomizing cap 19. Through the lower bore 14 in the web section 12 extends the rear end of the spray material needle valve 20 as well as the packing nut 21 and the packing retaining nipple 22, within which the nut 21 is threaded.

Within the cylinder 4 as shown in Figure 5 is an air piston assembly 23. This consists of a supporting cup 24 around the periphery of which is held the piston leather 25 by means of disc 26.

An axially positioned rod 27 is inserted from the rear through a central bore 28 in the disc 26 until a shoulder 29 on the rod abuts against the disc. The forward end of the rod 27 is threaded through a central bore in the cup 24 and beyond the cup has a threaded connection with trigger 30 which opens the spray material valve 20 and atomizing air valve 39.

As shown in Figures 5 and 9, this hollow trigger member 30 has a lateral opening 31 near its forward end for receiving the head 32 on the rear end of the needle 20. The opening 31 has an elongated portion 33 extending to the center of the forward end of the trigger for accommodating the shank of the needle 20 adjacent to the head 32. To impel the needle forwardly to its seat in the spray head a spring 34 is located within the hollow portion of the trigger.

This spring has its rear end thrust thereagainst the forward end of the rod 27 and its forward thrust against the needle through an intermediate movable disc 35. The bore of the trigger has a rearwardly facing shoulder 36 (Fig. 9)

just behind the lateral hole 31. This shoulder reduces the bore slightly below the diameter of the disc 35 whereby the disc may not move forward beyond the shoulder. This keeps it from moving into the space ordinarily occupied by the needle head 32 and interfering with the reinsertion of the head. The trigger has a downwardly extending finger 37 positioned to strike the stem 38 of the air valve 39 located in a housing 40 below the air cylinder (Fig. 7).

In the operation of the spray gun it is first mounted upon a rod having threaded engagement with bore 9. Air hoses are fastened to inlet nipples 6 and 7 and a spray material supply hose connected to inlet 18. The flow of air entering nipple 6 is ordinarily controlled by a valve (not shown) in synchronism with the conveyor (also not illustrated) carrying articles to be spray coated. When an article is in position to be coated the air enters nipple 6, travels through passage 41 into air cylinder 4 at the forward side of the piston 23 and the piston under the force of the air pressure upon the piston leather 25 moves rearwardly.

After the initial movement of the piston the air also acts upon the forward face of the cup 24. The piston moves rearwardly against the tension of spring 43 until the end of the rod 27 strikes against the inner side of cylinder cap 5. As shown in Figure 5, the cap is turned to its most forwardly position in which it does not permit the piston any movement. In practice the cap is set to stop the piston at a point where it will open the material needle to which it is attached at its forward end to a degree suitable for the desired discharge of coating material.

While the cap provides an adjustable stop means, in its rearward position its threaded engagement with the cylinder is slight and to relieve it of then receiving the blows of the piston rod 27 the supporting member 42 for the spring 43, which member is firmly threaded within the cylinder, has a heavy centrally located sleeve portion 44 which not only acts as a bearing guide for the rod but also serves as a stop for the piston when the disc 26 of the piston assembly strikes its forward side.

The cylinder cap 5 has four notches 69 spaced equidistantly around its forward edge 70. As shown in Figure 8 a sliding pin 71 is located in a bore 72 below the cylinder 4. This pin is urged toward the edge 70 by a spring 73 and by engaging a notch 69 holds the cap in any quarter turn position selected. To prevent the pin from slipping from the bore 72 a locking screw 74 extends into the bore and blocks the escape of the pin by intercepting a shoulder 75 on the inner end of the pin.

In the forward end of the cylinder is a packing nut 45, the inner bore of which also guides the piston by receiving the cylindrical trigger 30 which forms a forward extension of the piston assembly.

Through its connection with the needle 20 the rearward piston movement draws the needle from its seat 46 in the material discharge tip 47 allowing the material reaching the tip from the connection 18 to be discharged from the outlet port 48 of the tip. This material is atomized and shaped into an appropriate fan pattern by air discharged around it from the annular opening 49 between the tip and the air cap 19 and from ports 50 and 51 in the air cap. The ports 50 and 51 are actually circumferentially spaced as shown in Figure 2, although positioned

in line in Figure 4 to illustrate their source of air. The air reaches the spray head from connection 7 past valve 39 which is opened against spring 52 by rearward movement of the downwardly extending finger 37 of the needle. This air travels through the passage 53 which leads through the arm 11 and terminates at opening 54 in the bore 13. From here the air passes through ports 55 in the connector 3 and enters passage 56 in the spray head. Here it is divided, one portion passing past the adjusted opening 57 between the valve 58 and its seat 59, then into passage 60, around baffles 61, through annular chamber 62 and into passages 63 leading to the ports 50 of the horns 64 of the cap 19. The other portion of the air goes through the port 65 (indicated with dotted lines in Fig. 4) into the annular chamber 66, and into the space 67 between the tip and the air cap, from which it flows through annular port 49 and air cap ports 51. As indicated, the pressure of the air to the horns is determined by the position of valve 58 as adjusted by turning the knob 68.

It may be seen from the above that the piston is particularly well supported and aligned by having the cylindrical portion of the trigger 30 extending forwardly from the piston assembly and riding in the bore of nut 45 in addition to having the rear extension of rod 27 bearing in the sleeve 44 of the spring retainer 42. The latter member is sturdily constructed with a substantial threaded engagement with the cylinder and thereby provides a reliable final stop for the piston.

When it is desired to remove the spray head with the needle, from the gun body it is readily accomplished by releasing the connector 3 and after the spray head is partially detached, by moving the needle head laterally through the port 31 in the side of the needle bore. Replacement of the trigger into its connection with the trigger 30 is done without difficulty as the disc 35 is prevented from obstructing the space by the restriction of shoulder 36. Another feature of the invention is the arrangement of the pin 71 for holding the cylinder cap in any desired position. This purpose is accomplished with a minimum number of parts located in a concealed position.

If the spring 43 were supported upon the cap 5, its tension against the piston would vary according to the adjusted axial position of the cap. This would be undesirable as it would result in too violent a spring force against the piston with the cap at one of its extreme positions and in too tight a force for quick action in the other extreme position. Instead, with the spring retainer 42 in a fixed position a spring tension most suitable for general use may be predetermined and maintained.

In order to insure the presence of atomizing air at the nozzle, the finger 37 contacts the air valve stem 38 before the head 32 of the material valve is moved rearwardly by the end wall of the bore of trigger 30.

Placing the two air inlet connections in parallel arrangement beneath the cylinder contributes with the balance of the design to providing a spray gun of a compact, readily operable construction.

Although a preferred embodiment of the invention is shown and described herein it is to be understood that modifications may be made therein without departing from the spirit and scope of the invention as set forth in the appended claims.

What is claimed is:

1. In a spray gun of the class described wherein a fluid operated needle valve for controlling the material discharge is employed, a cylinder at the rear end of the gun, a piston mounted in the cylinder and normally standing at its forward end, a rod projecting axially from the piston through the front end of the cylinder, two air inlet passages with their inlet openings facing rearwardly lying side by side beneath the air cylinder and parallel therewith, the first of said passages leading to the front end of the cylinder for delivering piston actuating air, the second of said passages leading to the forward end of the spray gun for delivering material atomizing air, a normally closed valve in said second passage and having a forwardly projecting stem exposed at its forward end, said valve being rearwardly movable to open position, an arm projecting downwardly from said piston rod in advance of the cylinder and laterally extending end portion on said arm operable to contact said stem and open said valve when the piston is moved rearwardly.

2. In a spray gun of the class described, a reciprocally movable trigger member movable in one direction by spring action and in the other direction by fluid pressure, said member having a cylindrical chamber therein with a restricted opening at its forward end and an associated opening on a side adjacent its forward end, a reciprocally movable needle valve for controlling the material discharge of the gun, said valve having an enlargement at its rear end for introduction into said chamber through said openings and a coactive engagement with the inner forward wall of said chamber, a spring thrust forwardly from its support at the rear end of said chamber toward the rear end of the valve to normally hold the valve in forwardly projected position relative to said trigger member, a spring retaining disc between the spring and the enlarged end of the valve and a restriction in the inner wall of the chamber preventing the disc from reaching the forward end of the chamber with which the openings communicate, whereby the disc is not forced by the spring into the space normally occupied by the enlarged end of the valve when the valve is disconnected from the trigger member.

3. In a spray gun of the class described, separable spray head and body parts, the spray head having separate passages for the discharge of material to be sprayed and for atomizing air and having at its rear end a centrally disposed rearwardly projected nipple and a rearwardly opening inlet above said nipple and in connection with the air passage, a needle type control valve for the material discharge projecting rearwardly from the head through said nipple, said body including a cylinder with a forwardly and rearwardly extending axis, fluid pressure controlled means reciprocally operable in said cylinder and connectable with said needle valve, said body having laterally spaced arms projecting forwardly from the lower portion of the forward end of the cylinder, said arms having upwardly turned end portions embracing opposite sides of the spray head, a bridge between said ends abutting the rear end of the spray head and having two openings, one above the other, the upper one registering with said inlet opening, the other receiving said nipple, and means extending through the upper opening into said inlet opening for releasably retaining said head and body in assembled relation.

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