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VALVE CONTROL MEANS FOR SPRAY GUNS

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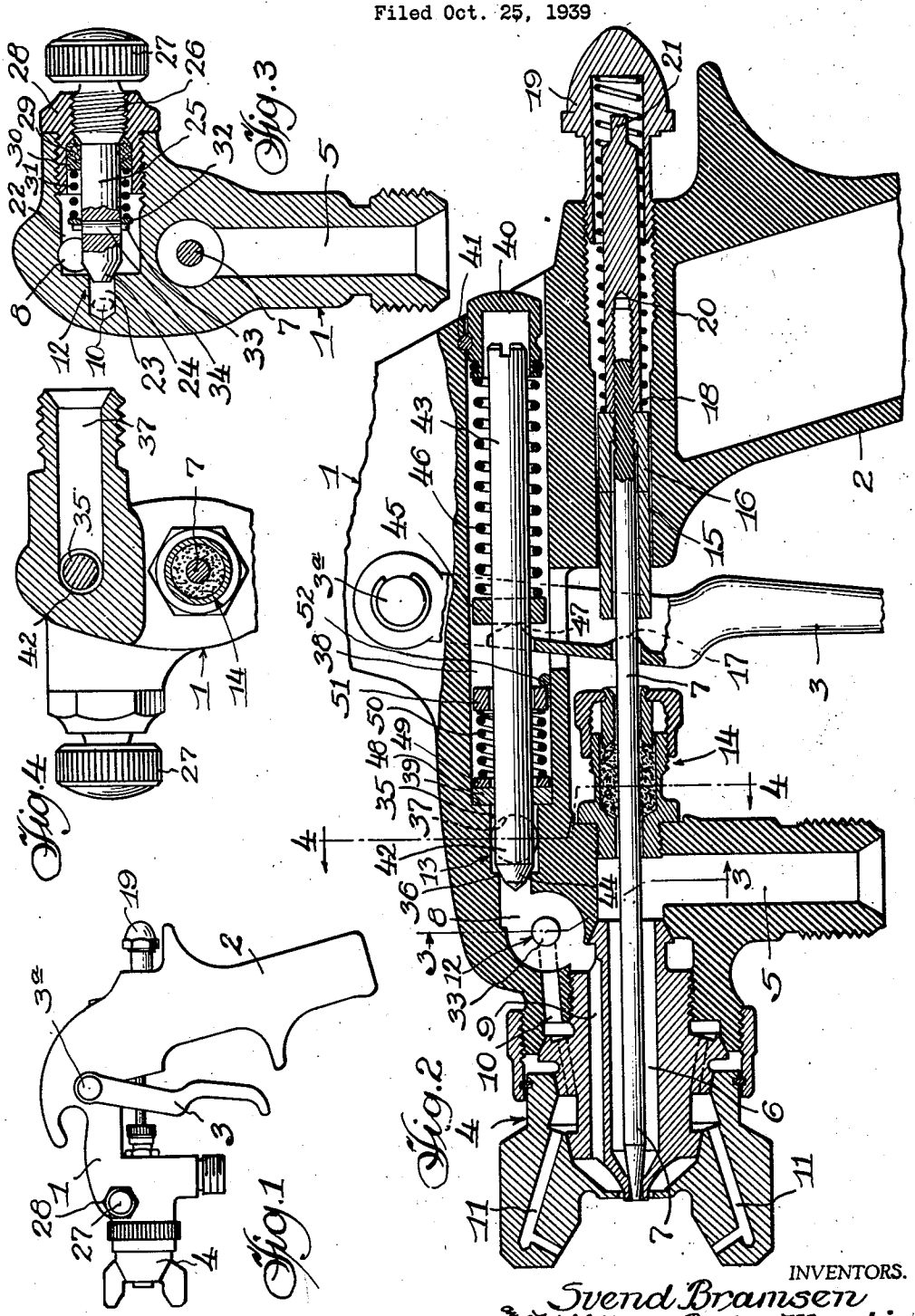


Fig. 1

Fig. 2

Fig. 3

Fig. 4

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VALVE CONTROL MEANS FOR SPRAY GUNS

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6 Claims. (Cl. 299—140.1)

The present invention relates to spray guns, such as those used for spraying paint and other coating materials, or the like, and has reference more particularly to the valve operating means thereof.

Spray guns usually have spring pressed material and air valves which are opened and held open by a trigger operated by the operator of the gun. During the time of spraying, the operator must constantly manually press back the trigger against the forces of the springs acting on the valves, and thus against the trigger, to normally close the valves. The force required by the operator to use is such as to tire his hand, even producing a cramping of it. The pressure applied by the hand is such as to reduce the circulation of blood whereby, when spraying in cold weather or in cold places, the hand becomes stiff.

The present invention has as one of its objects the provision of means which, after the initial opening of the valves is effected by a usual pressing of the trigger, will act to apply a force to counteract the closing forces of the valve springs to the extent that all the operator need do is to merely lightly press on the trigger to hold it in the position when the valves are open. This is made possible by making the air valve of large diameter whereby when the valve is opened the air pressure acting against the opened valve applies a force in the opening direction of the valve almost equal to the force of the air valve spring which acts directly against the valve.

Another object of the invention is to provide the air valve at the forward portion of the gun where it can directly control the air as it enters the gun, preferably at the side thereof, and to provide a large diameter but short air valve chamber with the valve seat at its forward end and the movable valve member extending forwardly through the chamber to seat on the valve seat mentioned. With the valve thus closed, the air in the chamber surrounds the valve member rearwardly of the seat without sufficient effect toward opening the valve, but when the valve is opened then the air pressure acts against the forward end of the valve member to apply a rearward force against it for the purposes above described. The valve member is also of large diameter so that its effective cross sectional area will be such, under the particular air pressure used to afford the back force against the valve spring, that it will hold the air valve open when the operator merely applies a light touch on the trigger.

Other objects, advantages, capabilities, features, and the like, are comprehended by the invention as will later appear, and as are inherently possessed by the invention.

Referring to the drawing:

Fig. 1 is a side view in elevation of a spray gun using the invention;

Fig. 2 is a longitudinal sectional view of the gun on an enlarged scale;

Fig. 3 is a transverse sectional view taken in planes represented by line 3—3 of Fig. 2; and

Fig. 4 is a transverse sectional view taken in planes represented by lines 4—4 in Fig. 2.

Referring more in detail to the drawing, the illustrative embodiment of the invention is shown in a spray gun comprising a body 1 having a handle 2, a trigger 3 pivotally mounted on the gun by way of the pivot means 3a, a nozzle structure 4 secured to the forward end of the gun, a material passage extending through the gun body and the nozzle structure and comprising passage portions 5 and 6, a needle valve 7 for controlling the passage 5—6, an air passage extending through the gun body and the nozzle structure and comprising air passage portions 8, 9, 10, and 11, a side valve 12 (Fig. 3) for controlling the passage of auxiliary air to the nozzle structure by way of passage portions 10 and 11, and an air valve 13 for controlling the supply of air to the gun parts.

The nozzle structure is of the kind disclosed in the copending application of William B. MacMartin, Serial No. 292,187, filed August 28, 1939, for Nozzle structures for spray guns.

The needle valve is slidable through a packed sealing means 14 and has its rear end extending in a bore 15 provided in a rear portion of the gun body, such rear end of the needle valve being threaded to adjustably receive a tubular nut 16 slidable in the bore 15, the forward end of the nut tube 16 being located to be engaged by bosses 17 on the trigger 3 when the operator moves the trigger rearwardly. In the bore 15 is a spring 18 which presses at its forward end against the rear end of the nut tube 16 to normally hold the needle valve closed and reacts at its other end against an adjustment cap 19, for adjusting the compression of the spring 18, threaded in the rear end of the bore 15. On the threaded end of the needle valve is a lock nut element 20 which has at its rear end a tool engaging part 21 for the adjusting and tightening of the element 20.

The side valve 12 for controlling the auxiliary air is shown in detail in Fig. 3, and comprises cross bores 22 and 23 provided in the forward

portion of the gun body and constituting valve chambers with a ported seat therebetween controlled by the seat portion 24 of a valve member having a smooth stem portion 25, a threaded part 26, and a knob 27. The threaded part 26 is adjustably threaded in a packing nut 28 secured in the end of the bore 22 at the side of the gun body. Within the nut 28 is a packing 29 held compressed by a presser plate 30 acted upon by a spring 31 located between the plate 30 and a washer 32 backed by lugs 33 at the ends of a cross pin 34, the inner rim of the washer 32 being located over the shouldered ends of the pin 34 so as to prevent the cross pin 34 from sliding out of its socket in the valve stem part 25. The air passage portion 8 is connected to the chamber 22 and the auxiliary passage portion 10 is connected to the chamber 23. The passage of air from the passage portion 8 to the auxiliary passage 10—11 is controlled by adjusting the valve seat part 24.

The novel air valve means 13 comprises a valve chamber 35 of large diameter provided at its forward end with a narrow valve seat 36 at the entry of the air passage portion 8, an air inlet 37 at the side of the gun body and connected to the chamber 35 rearwardly of the seat 36. The gun body is provided with a bore or chamber 38 of larger diameter than the chamber 35, and forming at its forward end a shoulder 39 at the rear end of the chamber 35. In the rear end of the bore 38 is a cap 40 held in place by a lock cross pin 41 extending through the gun body.

Extending longitudinally through the alined chambers 35 and 38 is a valve member in the form of a rod or cylinder, the forward portion 42 of which is located in the chamber 35 and constitutes the air valve proper, and the rearwardly extending portion 43 of which is located in the chamber 38 and constitutes the shank or stem of the valve. The forward end of the valve 42 is tapered with a steep pitch to form a seat 44 adapted to seat upon the seat 36. The valve part 42 is of smaller diameter than the chamber 35 so as to provide an annular chamber space about the valve part 42.

At an intermediate point of the valve part 43 is secured a collar 45 against which presses a spring 46, the rear end of the spring being suitably connected to the cap 40. See Fig. 2. Forwardly of the collar the trigger 3 has bosses 47 which engage the collar 45 when the trigger is moved rearwardly by the operator to open the valve 42 against the force of the spring 46.

At the forward end of the chamber 38 and surrounding the valve member 42—43 is a packing or sealing ring 48 which seats against the shoulder 39. This ring serves both the purpose of sealing against the passage of air from the chamber 35 around the valve member to the chamber 38 and for slidably guiding the movement of the valve member 42—43. Against the packing 48 is pressed a washer 49 by a spring 50, the rear end of this spring reacting against a ring 51 held in the chamber 38 by a lock cross pin 52 extending through the gun body.

The valve 42 is of large diameter so as to have a large cross sectional area whereby when the valve is opened by the operator pressing on the trigger, the air passing from the chamber 35 to the air passage 8 will press back against the valve with a force almost sufficient to hold the valve open, so that the operator then only needs to apply but very slight pressure on the trigger to hold the valve open. The air pressure used may be, by way of example, about thirty pounds, and the spring 46 so chosen as to have a force slightly greater than the force imposed by the air on the valve 42. The force of the spring 18, as is seen, is adjustable by the turning of the cap 19. When the operator acts to stop the spray he simply lets up on the trigger and the springs 46 and 18 will close the valves. So when the operator is spraying the light touch he applies to the trigger to maintain the valves open is of the value of the difference between the air force acting rearwardly against the air valve 42 and the force of the spring 46 acting forwardly against the trigger. That differential force may be varied as desired by varying the pressure of the air, and may be made so small as to make the operation of the trigger very sensitive.

While we have herein described and upon the drawing shown an illustrative embodiment of the invention, it is to be understood that the invention is not limited thereto but comprehends other constructions, details, arrangements of parts, features, and the like, without departing from the spirit of the invention.

Having thus disclosed the invention, we claim:

1. In a light touch type of spray gun which has air and material passages with spring pressed valves for controlling them, and a trigger means for operating the valves; a controlling device comprising an air valve chamber provided with an outlet port with a narrow seat at an end of the chamber and sealing and guiding means at the other end of the chamber, an air valve slidable in said latter means and having an end thereof extending in said chamber, said valve end having a tapered portion of steep pitch for seating on said port seat when closed and for direct action of the air thereagainst when open, the other end of the valve extending exteriorly of the chamber for action thereagainst of a spring acting with a force in the closing direction of the valve slightly greater than the force of the air acting against the end of the valve when in open condition whereby a slight touch on the trigger counteracts the difference of said forces for holding the valve open.

2. In a light touch type of spray gun which has air and material passages with spring pressed valves for controlling them, and a trigger means for operating the valves; a controlling device comprising an air valve chamber provided with an outlet port with a narrow seat at an end of the chamber and sealing and guiding means at the other end of the chamber, an air valve slidable in said latter means and having an end thereof extending in said chamber, said valve end having a tapered portion of steep pitch for seating on said port seat when closed and for direct action of the air thereagainst when open, the other end of the valve extending exteriorly of the chamber for action thereagainst of a spring acting with a force in the closing direction of the valve slightly greater than the force of the air acting against the end of the valve when in open condition whereby a slight touch on the trigger counteracts the difference of said forces for holding the valve open, said tapered end portion of said valve having a part thereof within said chamber rearward of the port seat when the valve is in closed condition for the action thereagainst of the air pressure in the chamber to assist in the sensitive opening of the valve when the trigger is operated.

3. In a light touch type of spray gun which has air and material passages with spring pressed valves for controlling them, and a trigger means for operating the valves; a controlling device comprising an air valve chamber provided with an outlet port with a narrow seat at an end of the chamber and sealing and guiding means at the other end of the chamber, an air valve slidable in said latter means and having an end thereof extending in said chamber, said valve end having a tapered portion of steep pitch for seating on said port seat when closed and for direct action of the air thereagainst when open, said tapered end portion of said valve having an axial width greater than the width of the port seat whereby a part of the tapered portion is exposed to the air pressure in the chamber when the valve is in closed position.

4. In a light touch type of spray gun which has air and material passages with spring pressed valves for controlling them, and a trigger means for operating the valves; a controlling device comprising an air valve chamber provided with an outlet port with a narrow seat at an end of the chamber and sealing and guiding means at the other end of the chamber, an air valve slidable in said latter means and having an end thereof extending in said chamber, said valve end having a tapered portion of steep pitch for seating on said port seat when closed and for direct action of the air thereagainst when open, said sealing and guiding means comprising a sealing ring at said other end of the chamber and having sealing and guiding contact with the valve, a holding ring spaced from said sealing ring, means fixed to the gun and contacting the holding ring for limiting its movement, and a spring between said rings and acting thereagainst to hold them in place.

5. In a light touch type of spray gun which has air and material passages with spring pressed valves for controlling them, and a trigger means for operating the valves; a controlling device comprising an air valve chamber provided with an outlet port with a narrow seat at an end of the chamber and sealing and guiding means at the other end of the chamber, an air valve slidable in said latter means and having an end thereof extending in said chamber, said valve end having a tapered portion of steep pitch for seating on said port seat when closed and for direct action of the air thereagainst when open, said sealing and guiding means comprising a sealing ring at said other end of the chamber and having sealing and guiding contact with the valve, a holding ring spaced from said sealing ring, means fixed to the gun and contacting the holding ring for limiting its movement, and a spring between said rings and acting thereagainst to hold them in place, said fixed means being in the form of a cross pin secured in the body of the gun and lying adjacent an end of said holding ring.

6. In a light touch type of spray gun which has air and material passages with spring pressed valves for controlling them, and a trigger means for operating the valves; a controlling device comprising an air valve chamber provided with an outlet port with a narrow seat at an end of the chamber and sealing and guiding means at the other end of the chamber, an air valve slidable in said latter means and having an end thereof extending in said chamber, said valve end having a tapered portion of steep pitch for seating on said port seat when closed and for direct action of the air thereagainst when open, said exteriorly extending portion of the valve having a collar secured to it, a cap at the outer end of the valve, a cross pin secured in the body of the gun and engaging the cap to hold it in place, and a spring between said collar and said cap for acting thereagainst for urging the valve in a closing direction.

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