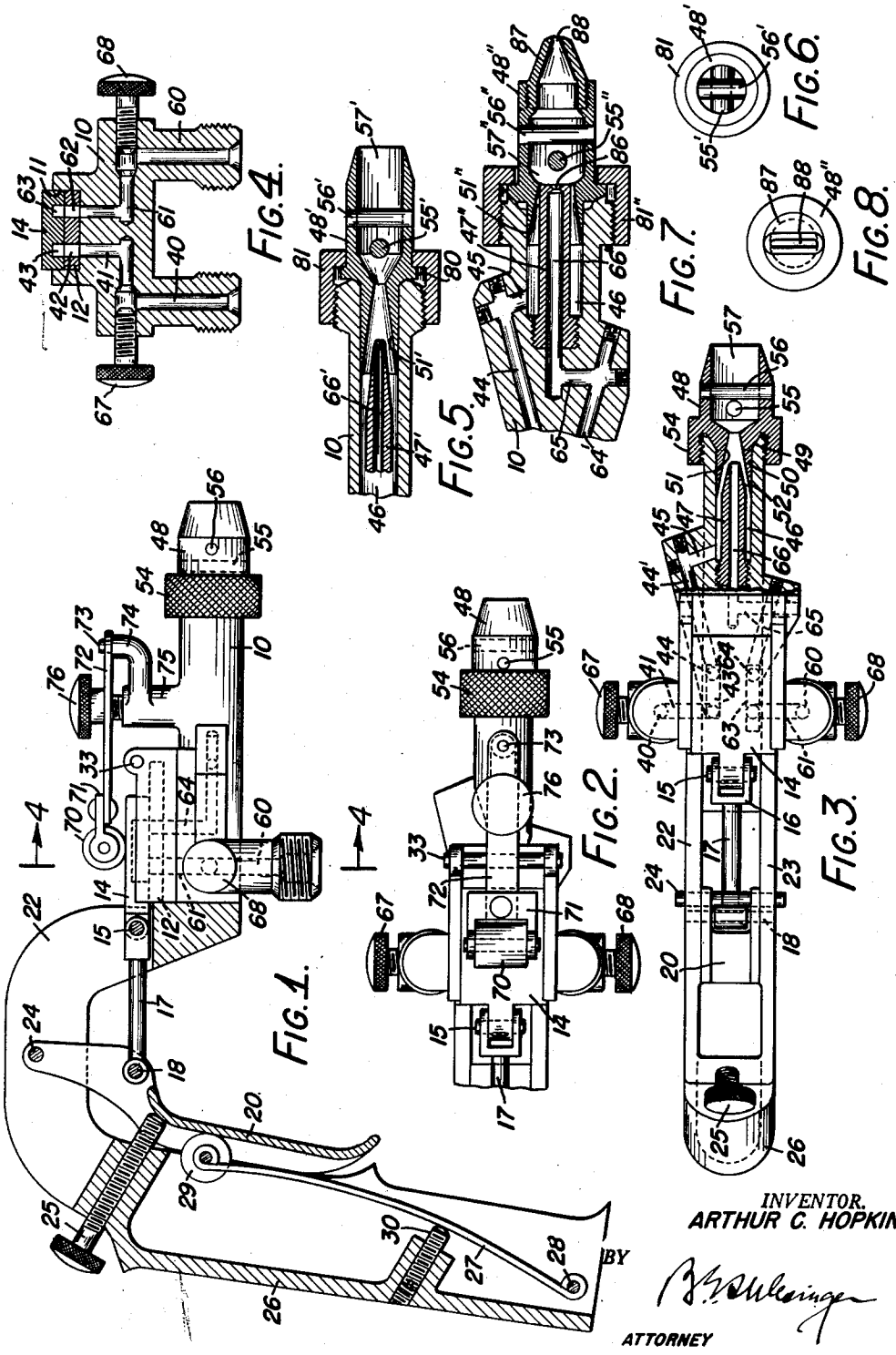
Aug. 21, 1956 A. C. HOPKINS 2,759,772

SPRAY GUN

Filed Dec. 15, 1954



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United States Patent Office 2,759,772 Patented Aug. 21, 1956

2,759,772

SPRAY GUN

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Application December 15, 1954, Serial No. 475,463

6 Claims. (Cl. 299—140)

The present invention relates to spray guns, particularly for spraying paint, lacquer and similar liquids.

In the conventional spray gun, the air is mixed with the paint or lacquer outside the paint or lacquer nozzle. The lacquer or paint is discharged from its nozzle under about eight pounds pressure and air under forty pounds pressure or so hits the liquid to atomize the liquid, and to drive the liquid on out of the nozzle of the gun and to carry the atomized liquid on to the object being painted. It has been found, however, that the high velocity or pressure of the air dries the atomized droplets of paint or lacquer, so that forty to fifty percent of the paint or lacquer is actually dried and lost before it reaches the object being coated.

In the conventional spray gun, moreover, conventional conical valves are provided to control the flow of air and of paint or lacquer, and gaskets or washers are used to insure proper seating of these valves. The gaskets or washers tend to deteriorate very rapidly, however, because of the solvent in the lacquer or paint.

In the conventional spray gun, furthermore, lacquer or paint is left in the nozzle, after the gun is shut off, which dries in the nozzle thus tending to clog the gun.

One object of the present invention is to provide a spray gun which will be more efficient in the use of paint or lacquer, or the like. To this end it is an aim of the invention to provide a spray gun in which the paint or lacquer can be supplied to the mixing chamber under low pressure, and no high air pressure will have to be used to atomize the liquid.

Another object of the invention is to provide a spray gun in which the compressed air is supplied in such way as simultaneously to atomize the liquid coating material and to drive it forward to the object to be coated.

Another object of the invention is to provide a spray gun of the character described in which the air operates to automatically clean paint out of the gun when the paint flow is stopped, and to clean the gun again before the paint flow is started.

Another object of the invention is to provide an improved spray gun which is so constructed that the air will come on before the paint starts to flow, and will remain on after the paint flow is stopped thus insuring against paint drying in the nozzle and clogging the gun.

Another object of the invention is to provide a spray gun having an improved type of valve which will seat very tightly and which will be unaffected by solvents in the paint or lacquer, and which has a life as long as the life of the gun itself.

Other objects of the invention is to simplify the structure of a spray gun, so that it will not only be inexpensive in construction but will be more efficient in use, positive in operation, uniform in action, easily controlled, and unlikely to get out of order.

Other objects of the invention will be apparent hereinafter from the specification and from the recital of the appended claims.

In the drawing:

Fig. 1 is a part section, part side elevation, of a spray gun constructed according to one embodiment of this invention;

Fig. 2 is a fragmentary plan view of this gun;

Fig. 3 is a part plan view, part section of this gun;

Fig. 4 is a transverse section through the gun taken substantially on the line 4—4 of Fig. 1, looking in the direction of the arrows;

Fig. 5 is a fragmentary section showing a modified form of nozzle for the gun;

Fig. 6 is a front view of the nozzle shown in Fig. 5;

Fig. 7 is a fragmentary section showing a still further form of nozzle; and

Fig. 8 is a front view of the nozzle of Fig. 7.

Referring now to the drawings and first to Figs. 1 to 4 inclusive, **10** denotes the body portion or barrel of the spray gun. The body portion or barrel **10** is recessed at its top, as indicated at **11** in Fig. 4, and has a hardened, superfinished metal plate **12** fastened in the recess. Slidably mounted on the plate **12** is another hardened, superfinished, metal plate **14**. The two plates **12** and **14** constitute together the control valve of the spray gun, as will appear hereinafter. Plate **14** is the movable (slidable) element of this valve. It is connected by a pin **15** (Figs. 1 and 3) with the front furcated end **16** of a link **17**. This link **17** is pivotally connected at its rear end by means of pin **18** to the rockable operating lever, or trigger, **20** of the gun.

The body portion or barrel **10** of the gun has a hand or pistol grip **26** riveted or otherwise secured to it at its rear end. This hand or pistol grip includes the two spaced plates **22**, **23**. The trigger **20** is pivotally mounted between these plates by pin **24**. The link **17** travels in the space between these plates. The movement of the trigger **20** is limited by an adjustable stop screw **25** that threads into a solid intermediate block portion of the hand grip **26**. By adjusting this screw the flow of the fluid, may be regulated from nothing to full port opening as will be clear hereinafter. A leaf spring **27**, that is fastened at one end by means of screw **28** to the hand grip, and that carries a roller **29** at its other end, serves to resiliently press the trigger **20** counterclockwise about its pivot **24**, to urge valve member **14** constantly toward closed position. The leaf spring **27** fulcrums on a screw **30** that is adjustably threaded into the hand grip.

The lacquer, or paint, or other coating liquid is supplied to the gun from a hose through ducts **40** and **41** (Fig. 4) in the body portion **10** of the gun. Duct **41** communicates with a rear hole **42** that extends through plate **12**. This hole is adapted, in turn, to communicate with an elongate groove **43** in the bottom surface of the plate **14**.

The plate **12** has another hole **44** in it adjacent its front end which also communicates with groove **43** in plate **14**, thereby connecting holes **42** and **44**, when plate **14** is pulled to the left as shown in Fig. 1. The body portion **10** has a duct **44** in it, which communicates with hole **44** and which extends first downwardly, then forwardly and outwardly, as shown in Fig. 3. The duct **44** communicates at its front end with an angular duct **45** which supplies the lacquer or paint to a chamber **46** formed in barrel **10**. Chamber **46** surrounds an air jet **47** that is threaded into the body portion or barrel **10**.

A removable nozzle **48** is threaded on the front end of the body portion or barrel **10**. This nozzle **48** has a conical or spherical seating portion **49** which seats in a correspondingly shaped seat formed on the front end of the bore **46** of body portion or barrel **10**. Seating portion **49** forms part of the peripheral surface of a rearwardly extending sleeve-like projection **50** formed on nozzle **48**,

which fits tightly in the bore or chamber **46** of the body **10**. The sleeve portion **50** of the nozzle has a forwardly tapering conical bore **51** which surrounds the conical tip **52** of air jet **47** and which has substantially the same cone angle as the outside surface **52** of the air jet.

The bore **51** communicates with the discharge chamber **57** of the nozzle. Mounted in the chamber **57** to extend transversely of one another are two pins **55** and **56**. The nozzle has a collar portion **54**, which surrounds its sleeve portion **50**, and which is spaced radially from the sleeve portion. This collar portion is internally threaded and externally knurled so that it can readily be threaded on the body portion or barrel **10** of the gun.

An airline for compressed air is connected to a duct **60** (Fig. 4), similar to duct **40**. This duct in turn leads into a right angular duct **61**, similar to duct **41**, which in turn leads into a hole **62** in the plate **12**. This hole communicates with a longitudinal groove **63** in the underface of the plate **14**, parallel to and similar to groove **43**. In the plate **12**, adjacent its forward end, is another hole **64**, which is adapted also to comunicate with groove **63** when plate **14** is in the position shown in Fig. 1. In the body portion **10** of the gun there is a duct **64'**, similar to duct **44'**. This duct communicates with a duct **65** (Figs. 3 and 7), which extends inwardly of the body portion of the gun, and which communicates with a duct **66** that extends axially, centrally through the air jet or nozzle **47**.

The compressed air flowing through the duct **66** atomizes the coating liquid and forces the lacquer or paint ahead of it out of the reduced diameter mouth of the chamber **46** into chamber **57**, where it is further broken up by pins **55** and **56**, and whence it is sprayed in a pattern controlled by the shape of the mouth of the chamber **57** on the wall or other object to be coated. The baffles **55** and **56** keep the air turbulent even though the air is slowed down after it leaves the air jet. This prevents the fluid from solidifying in the nozzle.

One of the features of the gun of the present invention is the sliding plate valve **14—12**. Unlike the valves used in conventional spray guns, the plates **14** and **12** do not require any gasket or washer between them. The upper surface of the plate **12** is superfinished and flat; and the opposed, lower surface of the plate **14** is also super-finished and flat. Due to the super-finish, the two plates have frictional adherence with one another so that they cannot be lifted apart, although they can be slid on one another. They provide, therefore, an excellent seal. No leakage can occur, therefore, between them. They are held in engagement, however, by a pressure roller **70** (Figs. 1 and 2) carried by a yoke **71** which is supported on the free end of a leaf spring **72**. This leaf spring is mounted on a pin or stud **73** which is secured in or integral with an arm **74** that extends laterally and upwardly from a boss **75**, which is formed on the upper face of the gun portion **10**. A knurled shoulder screw **76**, which engages the leaf spring **72** and which passes therethrough to thread into the boss **75**, is provided to adjust the pressure of the leaf spring **72**.

The valve **14—12** operates by sliding movement of the plate **14**. The valve is opened when the plate **14** is pulled to the left as shown in Fig. 1. By releasing the trigger **20** it is returned to normal, closed position by spring **27** operating through trigger **20**. When the plate **14** is pulled to the left by operation of the trigger **20**, the groove **43** in the plate **14** is brought into registry with the ports **42** and **44** in plate **12**, and the groove **63** in plate **14** is brought into registry with ports **62** and **64** in plate **12**. This permits the coating liquid and the compresed air to flow into the chamber **46** and into the jet duct **66**, respectively. The paint or lacquer can be supplied to the chamber **46** under low pressure. It is expelled from the gun by the pressure of the compressed air flowing out of the duct **66**. In conventional guns, the mixing of the air with the paint or lacquer occurs outside the paint nozzle or jet. This requires greater air pressure because the air does not drive the paint or lacquer to the surface being coated but only atomizes it. In the gun of the present invention the air drives the lacquer or paint, as well as atomizes it.

When the trigger **20** is released, the spring **27** returns the plate **14** to the right, and the solid portion of plate **14** covers ports **42** and **62** of plate **12**, thereby closing off the ports **42** and **62** from communication with grooves **43** and **63**, and stopping flow of both the coating medium and the compressed air. The forward, return movement of the block **14** under actuation of the spring **27**, when the trigger **20** is released, is stopped by a stop pin **33** (Figs. 1 and 2) which is secured in the body portion **10**.

It will be noted that the groove **63** in the plate **14** for the air line is longer than the groove **43** for the paint or lacquer. This insures that groove **63** will register with port **62** before groove **43** registers with port **42**, and that groove **63** will remain in registry with port **62** after groove **43** has moved out of registry with port **42** and the solid portion of plate **14** has covered port **42**. Thus, the air will come on before the paint starts to flow, when the trigger is pressed to pull the plate **14** to the left in Fig. 1; and the air will remain on after the paint flow is stopped, when the trigger is released. Thus the nozzle **48** will be cleaned out by air before the paint or lacquer starts to flow, and will be cleaned out again by air after the paint or lacquer is shut off. This insures against paint or lacquer drying in the nozzle and clogging the gun.

In the conventional gun forty to fifty percent of the paint or lacquer is lost because, due to the high air pressure, the droplets dry before they hit the surface being coated. Applicant's gun eliminates the high pressures, and insures maximum efficiency in use of the paint or lacquer. Screws **67** and **68** which thread into the gun portion **10** at the junctures, respectively, of the ducts **40** and **41** and of the ducts **60** and **61**, serve as throttle valves controlling the amount of liquid and air, respectively, flowing into the gun.

In the conventional gun, the gasket or washer used for the control valve deteriorates very rapidly because of the solvent in the lacquer and paint. There is no such possible deterioration of the sliding block **14** of the present gun, which acts as the control valve. This block, and the block **12** can be made, for instance, of tungsten carbide, or any hard material, which can be super-finished, and which is resistant to wear.

Various forms of nozzles may be employed in the gun of the present invention. One form of nozzle is shown in Figs. 1, 2 and 3. Here chamber **57** has a circular mouth and delivers the atomized coating material in a circular spray.

Another form of nozzle is shown in Figs. 5 and 6. Here the air jet **47'** may be similar to the air jet **47** described in the first embodiment of the invention, but the nozzle itself is made in two pieces, one piece **48'** setting into the forward end of the sleeve-like gun portion **10** and having a forwardly tapering conical bore **51'** similar to the bore **51** of nozzle **48**. Here the nozzle is provided, however, with a flange portion **80** and there is a separate knurled ring nut **81** which engages over this flange portion and threads onto the forward end of the tubular gun portion **10** to hold the nozzle in place on the gun. Nozzle **48'** has also a somewhat longer forwardly tapering, conical bore **51'** than bore **51** of nozzle **48**; and chamber **57'** of nozzle **48'** has also a somewhat longer rearwardly tapering rear portion joining bore **51'** to define a narrow mouth between the two bores. Pins **55'** and **56'** are provided in the nozzle **48'**, as in the first described embodiment of the invention, for the purpose of creating turbulence in the atomized paint or lacquer to insure uniformity of distribution of the paint or lacquer over the surface being painted. The nozzle of Fig. 5 has the advantage over the nozzle of Fig. 3 that the nozzle portion **48'** can be adjusted at any angle about its axis, as

required in order to insure proper placing of the paint upon the surface, being painted.

Another form of nozzle that may be used on the gun of the present invention is illustrated in Figs. 7 and 8. Here the air jet 47'' threads into the body portion 10 of the gun as in the previous embodiments, but is flatted off at its front end and has a restricted mouth, denoted at 86 formed at the convergence of a recess in the front face of the air jet and of a bluntly tapered portion at the front end of the duct 66''. Here the air jet extends completely through the tapered bore 51'' of the nozzle piece 48'', leaving but a very narrow annular space around it between the nozzle piece and the air jet. With this nozzle the paint is mixed with the air in the enlarged chamber 57'' formed in the nozzlepiece 48''; and it is in this chamber 57'' that atomizing occurs. This chamber 57'' is considerably enlarged as compared with the chambers 57 and 57', respectively, of the nozzles shown in Figs. 3 and 5. The small angles at the inside and outside of the mouth of the air jet 47'' tend to explode the air and to cause a wide spray.

The nozzle 48'' has a removable tip 87 which threads in it. As in the embodiment of the invention shown in Fig. 5, the nozzle 43'' is adjustable angularly about its longitudinal axis and is held on the gun portion 10 by a knurled nut 81''. The tip 87 has an elongate opening, 88, as clearly shown in Fig. 8. This controls the pattern of the spray issuing from the gun. In the embodiments of the invention shown in Figs. 3 and 6 the mouth of the nozzle is round.

In conventional guns approximately five thousand cubic inches of air are used for each cubic inch of fluid. In the gun of the present invention the air is mixed with the lacquer or paint inside the gun. Therefore, low pressure can be used on the paint, increasing the efficiency of the gun, and reducing loss of paint or lacquer seventy-five percent or more.

While the invention has been described in connection with several different embodiments thereof, it will be understood that it is capable of further modification; and this application is intended to cover any variations, uses, or adaptations of the invention following, in general, the principles of the invention and including such departures from the present disclosure as come within known or customary practice in the art to which the invention pertains, and as may be applied to the essential features hereinbefore set forth and as fall within the scope of the invention or the limits of the appended claims.

Having thus described my invention, what I claim is:

1. A spray gun comprising a barrel, a discharge nozzle mounted on the forward end of said barrel, an axially-bored jet nozzle mounted in said barrel and communicating with said discharge nozzle, said barrel and discharge nozzle having a conjoint bore, said jet nozzle having a stem of less diameter than the diameter of said bore whereby to provide a chamber between said jet nozzle and said bore, a liquid conduit for supplying liquid to said chamber, a second conduit for supplying a compressed gas to said jet nozzle, and a single valve for controlling the supply both of said liquid to said liquid conduit and of the compressed gas to said second conduit, said valve comprising a pair of plates, one of which has two pairs of ports therein, one port of one pair of ports communicating with said liquid conduit and the other port of said one pair of ports communicating with the source of supply of the liquid, one port of the other pair of ports communicating with said second conduit and the other port of said other pair of ports communicating with the source of supply of the compressed gas, the other of said plates having a pair of grooves therein, one of which registers, respectively, with the first-named pair of ports when said valve is open and the other of which registers with the other pair of ports when said valve is open, one of said plates being reciprocable on the other, and when moved in one direction opening said valve, and when moved in the opposite direction closing said valve, and means for reciprocating said reciprocable plate.

2. A spray gun comprising a barrel, a discharge nozzle mounted on the forward end of said barrel, an axially-bored jet nozzle mounted in said barrel and communicating with said discharge nozzle, said barrel and discharge nozzle having a conjoint bore, said jet nozzle having a stem of less diameter than the diameter of said bore whereby to provide a chamber between said jet nozzle and said bore, a liquid conduit for supplying liquid to said chamber, a second conduit for supplying a compressed gas to said jet nozzle, and a single valve for controlling the supply both of said liquid to said liquid conduit and of the compressed gas to said second conduit, said valve comprising a pair of plates, one of which has two pairs of ports therein, one port of one pair of ports communicating with said liquid conduit and the other port of said one pair of ports communicating with the source of supply of the liquid, one port of the other pair of ports communicating with said second conduit and the other port of said other pair of ports communicating with the source of supply of the compressed gas, the other of said plates having a pair of grooves therein, one of which registers with and connects both of said one pair of ports when said valve is open and the other of which registers with and connects both of said other pair of ports when said valve is open, said other plate being reciprocably slidable on said one plate and being moveable in one direction to open said valve and in the opposite direction to close said valve, the second-named groove of said other plate being longer than the first-named groove thereof, whereby the compressed air supply is turned on before, and shut off after, the liquid supply.

3. A spray gun having a nozzle, a liquid conduit for supplying liquid to said nozzle, a gas conduit for supplying compressed gas to said nozzle to atomize the liquid, and a single valve for controlling the supply both of the liquid and of the compressed gas to said nozzle, said valve comprising a pair of plates, one of which has two pairs of ports therein, one port of one pair of ports communicating with said liquid conduit and the other port of said one pair of ports communicating with the source of supply of the liquid, one port of the other pair of ports communicating with said second conduit and the other port of said other pair of ports communicating with a source of supply of the compressed gas, the other of said plates having a pair of grooves therein, one of which registers, respectively, with the first-named pair of ports when said valve is open and the other of which registers with the other pair of ports when said valve is open, one of said plates being reciprocable on the other, and when moved in one direction opening said valve, and when moved in the opposite direction closing said valve, and means for reciprocating said reciprocable plate.

4. A spray gun having a nozzle, a liquid conduit for supplying liquid to said nozzle, a gas conduit for supplying compressed gas to said nozzle to atomize the liquid, and a single valve for controlling the supply both of the liquid and of the compressed gas to said nozzle, said valve comprising a pair of plates, one of which has two pairs of ports therein, one port of one pair of ports communicating with said liquid conduit and the other port of said one pair of ports communicating with the source of supply of the liquid, one port of the other pair of ports communicating with said second conduit and the other port of said other pair of ports communicating with the source of supply of the compressed gas, the other of said plates having a pair of grooves therein, one of which registers with and connects both of said one pair of ports when said valve is open and the other of which registers with and connects both of said other pair of ports when said valve is open, said other plate being reciprocably slidable on said one plate and being movable in one direction to open said valve and in the

opposite direction to close said valve, the second-named groove of said other plate being longer than the first-named groove thereof, whereby the compressed air supply is turned on before, and shut off after, the liquid supply.

5. A spray gun comprising a barrel, a discharge nozzle mounted on the forward end of said barrel, said barrel and discharge nozzle having a conjoint bore which along part of its length has a forwardly converging taper, an axially bored jet nozzle mounted in said bore and having its front end disposed rearwardly at a distance from the front end of the tapered part of said bore, said jet nozzle having a stem of less diameter than said bore, whereby to provide a chamber between said jet nozzle and said bore, a liquid conduit for supplying a compressed gas to said jet nozzle, and a single valve for controlling the supply both of said liquid to said liquid conduit and of the compressed gas to said gas conduit, said valve comprising a pair of plates, one of which has two pairs of ports therein, one port of one pair of ports communicating with said liquid conduit and the other port of said one pair of ports communicating with the source of supply of the liquid, one port of the other pair of ports communicating with said second conduit and the other port of said other pair of ports communicating with the source of supply of the compressed gas, the other of said plates having a pair of grooves therein, one of which registers with and connects both of said one pair of ports when said valve is open and the other of which registers with and connects both of said other pair of ports when said valve is open, said other plate being reciprocably slidable on said one plate and being movable in one direction to open said valve and in the opposite direction to close said valve, the second-named groove of said other plate being longer than the first-named groove thereof, whereby the compressed air supply is turned on before, and shut off after, the liquid supply.

6. A spray gun comprising a barrel, a discharge nozzle mounted on the forward end of said barrel, said barrel

and discharge nozzle having a conjoint bore which along part of its length has a forwardly converging taper, an axially bored jet nozzle mounted in said bore and having its front end disposed rearwardly at a distance from the front end of the tapered part of said bore, said jet nozzle having a stem of less diameter than said bore, whereby to provide a chamber between said jet nozzle and said bore, a liquid conduit for supplying liquid to said chamber, a gas conduit for supplying a compressed gas to said jet nozzle, and a single valve for controlling the supply both of said liquid to said liquid conduit and of the compressed gas to said gas conduit, said valve comprising a pair of plates, one of which has two pairs of ports therein, one port of one pair of ports communicating with said liquid conduit and the other port of said one pair of ports communicating with the source of supply of the liquid, one port of the other pair of ports communicating with said second conduit and the other port of said other pair of ports communicating with the source of supply of the compressed gas, the other of said plates having a pair of grooves therein, one of which registers with and connects both of said one pair of ports when said valve is open and the other of which registers with and connects both of said other pair of ports when said valve is open, said other plate being reciprocably slidable on said one plate and being movable in one direction to open said valve and in the opposite direction to close said valve, the second-named groove of said other plate being longer than the first-named groove thereof, whereby the compressed air supply is turned on before, and shut off after, the liquid supply.

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