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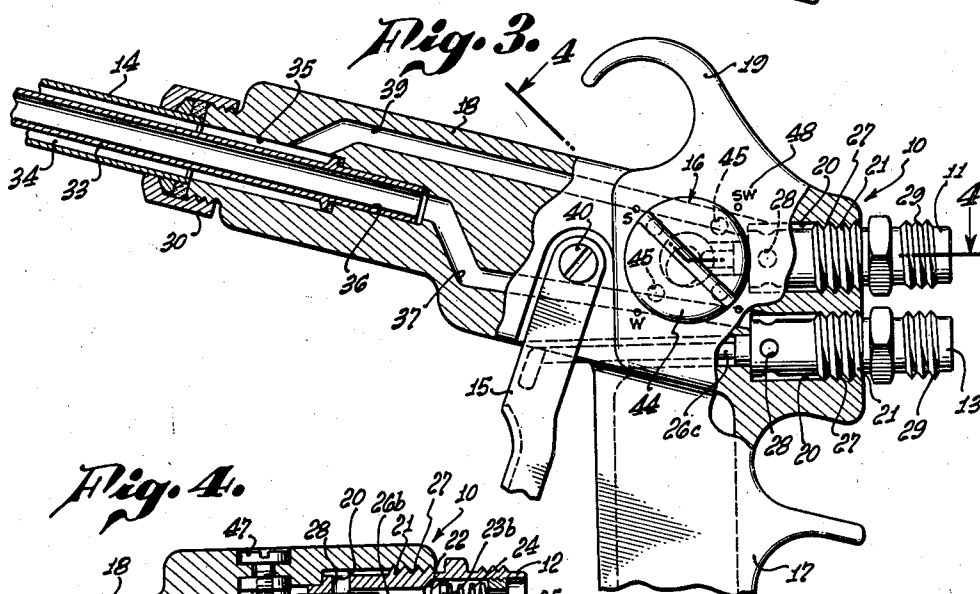
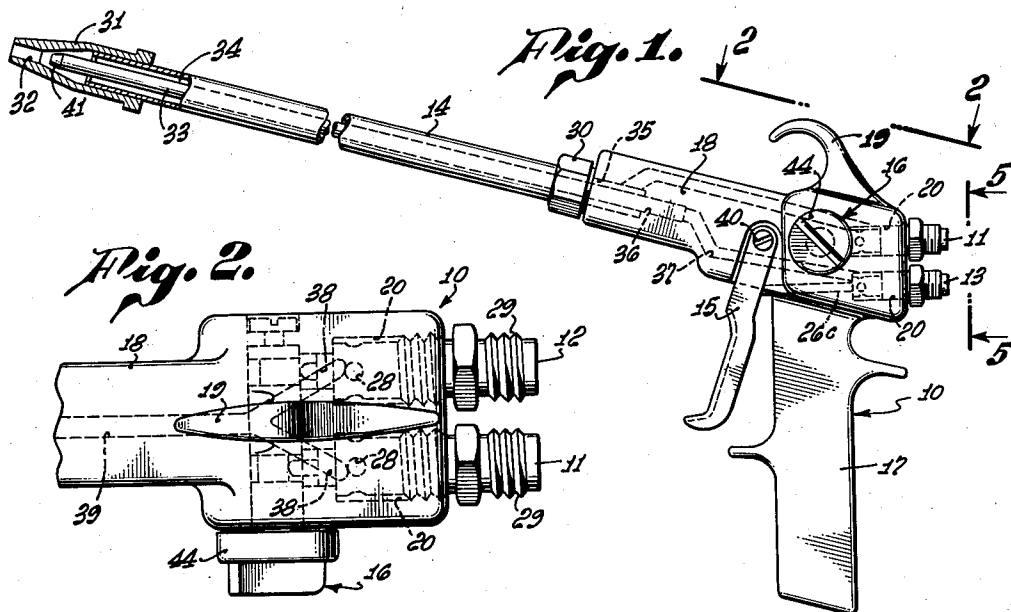
E. J. SANDERS ET AL

2,635,010

SPRAY GUN

Filed Feb. 27, 1950

2 SHEETS—SHEET 1



ELMORE J. SANDERS
J. ALLEN WIENS
EDISON J. MCCLAVE
INVENTORS

BY *Herbert White*

ATTORNEY.

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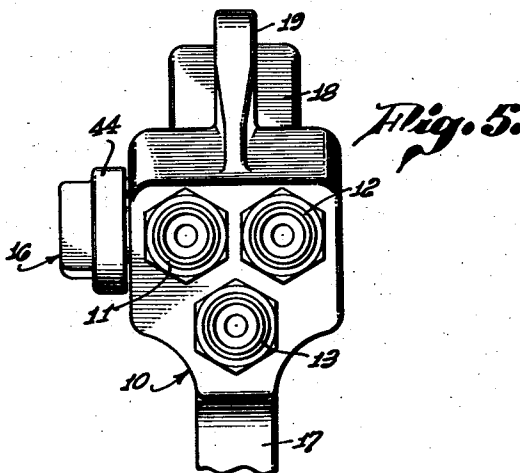
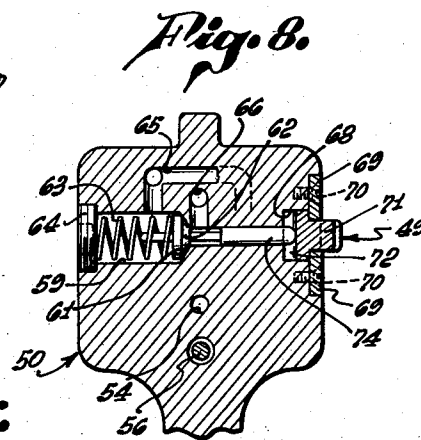
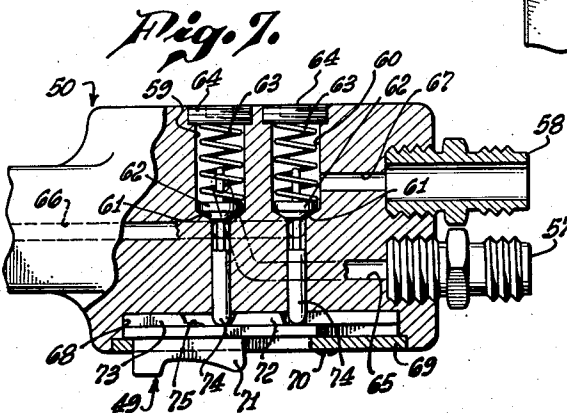
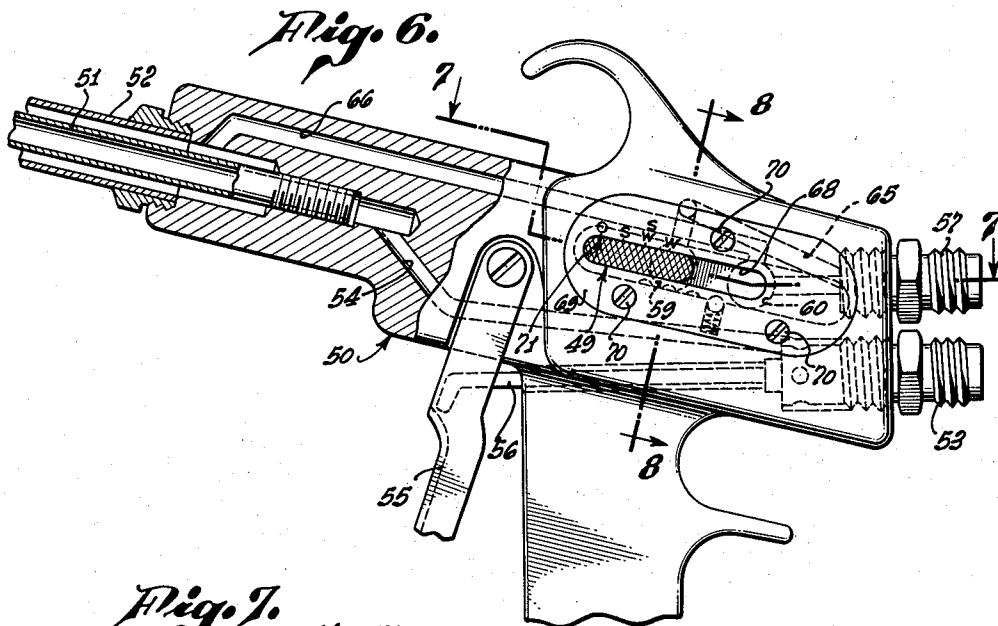
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SPRAY GUN

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2 SHEETS—SHEET 2



ELMORE J. SANDERS
J. ALLEN WIENS
EDISON J. MCCLAVE
INVENTORS.

BY *Harbin White*

ATTORNEY.

UNITED STATES PATENT OFFICE

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SPRAY GUN

Elmore J. Sanders, San Gabriel, John Allen Wiens, Burbank, and Edison J. McClave, Los Angeles, Calif.; said Wiens and said McClave assignors to said Sanders

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This invention relates generally to improved spray guns adapted for use in any of various situations in which it may be desired to selectively discharge a plurality of fluids, and particularly intended for use in cleaning automobile engines.

The layer of accumulated dirt and grease found on the average automobile engine may be quickly and effectively removed by successive impingement of the engine surfaces with a series of streams or sprays of various cleaning fluids. For instance, a stream of compressed air may first be employed to remove all loose dirt from the engine surfaces, after which a suitable hydrocarbon solvent may be directed against the engine to dissolve and carry away the oil, grease and similar constituents of the scale to be removed. Where water soluble dirt and other substances are found on the engine, a water spray or a mixed spray of water and solvent is often highly effective as a cleaning agent. At the completion of a cleaning job, a final jet of air may be employed to dry both the water and solvent from the engine surfaces.

The general object of the present invention is to provide an improved spray gun especially adapted for use in cleaning an engine or the like according to the above fluid impingement method. Specifically, guns embodying the invention are capable of positively and effectively controlling a number of fluids, as for instance compressed air, a hydrocarbon solvent, and water, without leakage, and with such simplicity of operation as to be useable in service stations and garages by virtually untrained personnel. Further, handling of the gun in use is facilitated by designing it to eject each of the various sprays in response to the same easily effected manipulation of a given operating element, preferably a trigger. As will appear, the particular fluid or fluids to be discharged by such actuation of the trigger may be easily selectable by the operation of a second control.

Structurally, the gun may comprise a handle body having inlets for compressed air, water and solvents, respectively, all communicating with a common discharge nozzle. A first valve, preferably trigger actuated, may control the delivery of air to the nozzle, while a pair of individual poppet valves control the discharge of water and solvent to the nozzle. A particular feature of the invention involves the provision and construction of a novel control unit, preferably a single cam element, for selectively actuating the water and solvent poppet valves.

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The above and further features and objects of the present invention will be better understood from the following detailed description of the typical embodiments illustrated in the accompanying drawings, in which:

Fig. 1 is a side view, partly in section, of a first form of gun embodying the invention especially adapted for use in cleaning automobile engines;

Fig. 2 is an enlarged fragmentary view of the rear portion of the gun taken on line 2—2 of Fig. 1;

Fig. 3 is an enlarged fragmentary side view, partly in section, and showing especially the valve actuating means;

Fig. 4 is a sectional view through the water and solvent controlling poppet valves and their actuating cam taken on line 4—4 of Fig. 3;

Fig. 5 is an enlarged fragmentary rear view of the gun showing the fluid inlets and taken on line 5—5 of Fig. 1;

Fig. 6 is a fragmentary side view of a second form of spray gun embodying the invention;

Fig. 7 is a sectional view of the second form of gun and taken on line 7—7 of Fig. 6; and

Fig. 8 is a transverse section taken on line 8—8 of Fig. 6.

Referring first to Figs. 1 through 5 and particularly to Fig. 1, the first form of engine cleaning spray gun there shown comprises essentially a handle body 10, three inlet valve units 11, 12 and 13 for controlling the flow of water, solvent and compressed air respectively through the gun, a discharge tube or barrel 14 projecting forwardly from the body, a trigger 15 for actuating the air inlet valve to control the delivery of air to the discharge tube, and a control unit or cam 16 for selectively actuating the water and solvent inlet valves.

Body 10 comprises a handle portion 17 and an upper forwardly projecting portion 18, and preferably has an integrally formed hook 19 on its upper surface for suspending the gun from a suitable bracket when not in use. The upper rear portion of the body may be enlarged and contains two upper and one lower rearwardly facing essentially cylindrical recesses 20 for partial reception of the valve units.

For simplicity of construction and to facilitate replacement of valve units 11, 12 and 13, each is formed as a removable unitary assembly, including a tubular fluid inlet body section 21 threadedly engaging the gun body at 27 and containing a poppet type valve 23a, 23b or 23c, engageable with an inner seat 22. A coil spring

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24 normally retains each valve against its seat, and is itself retained within the body section by tubular insert 25 threaded into the outer end of the valve body. The three valves are carried by three inwardly extending stems or actuating pins 26a, 26b and 26c, respectively, each of which projects from the inner end of the corresponding valve body. Each of the valve units is spaced from the wall of the corresponding recess 20 at a location inwardly beyond mounting threads 27 to form an annular passage into which fluid from within the valve unit flows through passages 28 when the valve is opened. The outer ends of the valve unit bodies are threaded at 29 for connection to individual fluid supply lines (not shown). As will be understood, each valve is actuatable between the closed position in which water valve 23a is shown in Fig. 4 and the open position of solvent valve 23b in that figure.

Discharge tube 14 is mounted at its rearward end to the gun body, as by nut 30, and carries at its forward end a discharge nozzle 31 having a forwardly tapering and then straight cylindrical inner bore 32. A second and smaller tube 33 extends concentrically within outer tube 14, and is spaced from that outer tube to form an annular passage 34 through which water and solvent flow. The gun body contains a bore 35 at its forward end of a diameter corresponding to the internal diameter of tube 14 to form a rearward continuation of that tube, and contains a counterbore 36 at the rear of bore 35 within which inner tube 33 is frictionally retained.

Air inlet valve unit 13 communicates with the rear of inner tube 33 through a passage 37 in the gun body which extends first forwardly from the annular space about the inlet valve, then upwardly at an angle, and then forwardly into the tube. Similarly, the water and solvent inlets communicate with the annular space 34 between the two delivery tubes through converging individual passages 38 leading into a common forwardly extending passage 39.

Air valve 13 is actuated by trigger 15 which is pivotally mounted to the body at 40. For this purpose, stem 26c of the air valve projects forwardly for engagement with the trigger to transmit trigger movement directly to the valve. Consequently, rearward swinging movement of the trigger opens the air valve to permit the discharge of a jet of high pressure air from the forward end 41 of the inner delivery tube 33.

The water and solvent controlling poppet valves 23a and 23b are actuated by a single rotary cam element 16 extending transversely through the gun body immediately forwardly of the valves and having cam surfaces 42 and 43 engaging the actuating pins 26a and 26b of the two valves respectively (see Fig. 4). At one side of the body, cam element 16 has an operating knob 44 containing four annularly spaced detent recesses 45 in its inner surface cooperable with spring pressed detent 46 to releasably retain the cam in any one of four positions. At the opposite side of the body, the cam is retained against axial movement by screw bolt 47. Suitable indicia 48 on the side of the gun body may indicate the setting of the cam.

The cam surfaces 42 and 43 are so designed and related that, in one position of the cam, both the water and solvent valves are closed so that only air escapes from the delivery tube upon actuation of the trigger. In a second rotative position of the cam, water valve 23a is opened to permit passage of water forwardly through the body

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to annular space 34 between the two delivery tubes. The jet of air proceeding from the forward end of inner tube 41 acts to entrain this water in the manner of an ejector to produce a water spray. Similarly, in a third position of the cam the water valve is closed and the solvent valve is opened and a spray of solvent is delivered from the nozzle. In the fourth cam position, both the water and solvent valves are open and a mixed spray is produced.

In using the gun, individual water, solvent and air supply hoses are first connected to the rearwardly projecting ends of the respective valve unit bodies 11, 12 and 13. Air delivered to the gun is under sufficient pressure to produce an effective spray, while the water and solvent are preferably at or near atmospheric pressure. To prepare an automobile engine for cleaning, the lubricating oil filling cap should be removed and a plug inserted in its place. All other parts of the engine may be left exposed to the cleaning action of the gun.

In cleaning an engine, selector cam 16 is first turned to the position in which both the water and solvent valves are closed, and trigger 15 is then actuated to emit a stream of high pressure air from the forward end of the nozzle, to remove all loose dirt from the engine. The cam may then be turned to a position in which valve 23b is opened and solvent flows into annular passage 34 to be entrained in the air stream and impinge upon and clean the various engine surfaces. If water soluble material is found on the engine, water may be entrained in the air stream, either alone or with the solvent by a suitable setting of the cam. Finally, when the engine has been thoroughly cleaned, the cam may be returned to the position in which both the solvent and water valves are closed, and a stream of air alone may then be employed to quickly evaporate the water and solvent from the engine surfaces.

Figs. 6 through 8 show a variational form of gun embodying the invention in which a slide cam 49 is substituted for the rotary cam of the Fig. 1 form. The gun of Figs. 6 through 8 includes a body 50 generally similar to the body of Fig. 1 and carrying a pair of concentric inner and outer delivery tubes 51 and 52, each threadably mounted to the body. Air inlet valve unit 53, projecting rearwardly from the body and communicating through passage 54 with the inner delivery tube, is actuated by trigger 55 through stem 56.

Above valve 53, the body threadably carries a pair of rearwardly extending inlet fittings 57 and 58 connectible with a pair of water and solvent supply hoses, respectively. Forwardly of inlets 57 and 58, body 50 contains a pair of transversely extending bores 59 and 60 each forming an annular tapered valve seat 61 intermediate its length with which a valve 62 cooperates. Each of these valves is spring pressed toward its seat by a coil spring 63 retained by an outer plug 64. Water flows from inlet 57 through body passage 65 to the forward bore 59, then axially within that bore as permitted by the valve, and finally forwardly through passage 66 to the rear of delivery tube 52. Similarly, solvent flows from inlet 58 through passage 67 to the rear bore 60, then axially within that bore, and forwardly through passage 66.

Cam element 49 is slidably received within recess 68 in the side of the body, and is guided for forward and rearward sliding movement

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within the recess by a pair of upper and lower retaining plates 69 mounted to the body by screws 70. Button 71 on the cam element projects outwardly beyond plates 69 to permit manual movement of the cam. On its inner face, cam 49 has a pair of inwardly extending cam projections 72 and 73 engageable with actuating pins 74 of the water and solvent valves to operate those valves in accordance with movement of the cam.

The cam has four positions, as in the previous form of the invention for the selective delivery of air alone, solvent, water, or solvent and water together. However, in this form it is noted that the cam retains the water valve very slightly open at 75 in the solvent delivering position of the valve, so that a small amount of water is discharged with the solvent to eliminate any danger of combustion of the solvent spray. The operation of the gun is the same as in the first form except with respect to the manner of movement of the cam element between its various positions.

We claim:

1. A spray gun comprising a handle body, a discharge nozzle carried by the body, said body containing first and second passages connectible to supplies of a pair of liquids respectively and communicating with said nozzle to deliver the liquids thereto, said body containing a third passage connectible to a supply of compressed air and directing said air outwardly through said nozzle to engage and entrain said liquids, a valve carried by the body and operable to control the delivery of compressed air from said third passage to the discharge nozzle, a pair of poppet valves carried by the body in communication with said first and second passages respectively and operable to control the delivery of said liquids to the nozzle, a manually operable cam carried by the body for movement relative thereto and operable by said movement to selectively actuate said poppet valves, and a trigger carried by the body for movement independently of said cam and adapted to actuate said first mentioned valve independently of the operation of said poppet valves.

2. A spray gun comprising a handle body, discharge nozzle means carried by the body, said body containing three passages connectible to supplies of three fluids respectively and communicating with said discharge nozzle means to deliver the fluids thereto for discharge outwardly therefrom, first, second and third valve means carried by the body in communication with said passages respectively and operable to control the delivery of said three fluids respectively to the discharge nozzle means, control means movably carried by the body and operable to selectively actuate said first and second valve means, said body containing in its outer surface an inlet recess communicable with the end of one of said passages, and a tubular inlet fitting partially received within said recess and adapted for connection to a corresponding fluid supply line, one of said valve means being mounted within said inlet fitting to control the fluid passage there-through.

3. A spray gun comprising a handle body having first, second and third rearwardly facing recesses in its rear surface, first, second and third tubular inlet fittings partially received within and projecting rearwardly from said recesses respectively and connectible respectively to two liquid supply lines and a compressed air supply

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line, discharge nozzle means carried by the forward portion of the body, said body containing a first passage for conducting compressed air from said third recess and fitting to the nozzle means for discharge therethrough, said body containing additional passage means for conducting said liquids from the first and second fittings to the nozzle means for entrainment by the air stream, first, second and third poppet valves in said fittings respectively for controlling the delivery of said liquids and air respectively to the nozzle means, a rotary cam mounted within said body at a location forwardly of said fittings in engagement with said first and second poppet valves and operable in two conditions to selectively actuate said first and second valves respectively and in a third condition to actuate them together, and a manually operable actuating element carried by the body for movement relative to the cam and operable to actuate said third poppet valve independently of the operation of said first two valves.

4. A spray gun comprising a handle body having three fluid inlets, a first discharge tube carried by and projecting from said body, a second and smaller tube projecting from the body within and annularly spaced from the first tube, means forming a discharge nozzle at the forward end of said first tube through which both of the tubes discharge, means for conducting fluid from two of said inlets into the annular space between the tubes, means conducting pressure fluid from the third inlet into said second tube to flow outwardly from the forward end thereof through the nozzle and induce a corresponding flow of fluid from the space between the tubes, a pair of poppet valves carried by the body in communication with said two inlets respectively and operable to control the delivery of fluids from said two inlets to said annular space, a manually operable control cam carried by the body for movement relative thereto and operable by said movement to selectively actuate said poppet valves, a third valve for controlling the delivery of fluid from the third inlet to said second tube, and an actuating element carried by the body for movement relative to the cam and operable to actuate the third valve independently of the operation of the poppet valves.

5. A spray gun comprising a handle body having first, second and third rearwardly facing recesses in its rear surface, first, second and third tubular inlet fittings partially received within and projecting rearwardly from said recesses respectively and connectible respectively to two liquid supply lines and a compressed air supply line, a first discharge tube carried by and projecting forwardly from the body, a second and smaller tube projecting from the body within and annularly spaced from the first tube, a discharge nozzle at the forward end of said first tube through which both of said tubes discharge, said body containing a first passage for conducting compressed air from said third recess and fitting into said second tube for discharge from the forward end thereof through said nozzle, said body containing additional passage means for conducting said liquids from said first and second fittings to the nozzle for entrainment by the air stream, first, second and third poppet valves in said fittings respectively for controlling the delivery of said liquids and air respectively to the nozzle, a rotary cam mounted within said body at a location forwardly of said fittings in engagement with said first and second poppet

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valves and operable in two conditions respectively to selectively actuate said first and second valves, in a third condition to actuate them together, and in a fourth condition to permit both valves to substantially close, and a manually operable trigger carried by the body for movement relative to the cam and operable to actuate said third poppet valve independently of the operation of the first two valves.

6. A spray gun comprising a handle body, a discharge nozzle carried at a forward side of the body, first, second and third tubular inlet fittings projecting rearwardly from said body for connection to supply lines for compressed air and two liquids respectively, said body containing a passage for conducting air from the first fitting to said discharge nozzle to flow outwardly there-through, a first poppet valve carried by the body within said first inlet fitting for controlling the delivery of air to the nozzle, a trigger movably carried by the body and operable to actuate said first poppet valve, a pair of second and third poppet valves carried by the body in side by side relation and having their axes extending laterally of the body, said body containing passages for conducting said liquids from said second and third inlets respectively to said second and third poppet valves and then to the nozzle so that said second and third valves control the delivery of the liquids to the nozzle, and a manually operable control element carried by the body for sliding movement along one side thereof between a plurality of control positions, said element having inner cam surfaces engageable with said second and third poppet valves to control their actuation and operable in two of said positions respectively to selectively actuate said valves, in a third position to actuate them together, and in a fourth position to permit both valves to substantially close.

7. A spray gun comprising a portable body adapted to be held in the hand of an operator, a discharge nozzle structure carried by the body, said body containing first and second passages connectable to supplies of first and second liquids respectively and communicating with said nozzle structure to deliver liquids thereto, said body containing a third passage connectable to a supply of compressed air and directing said air outwardly through the nozzle structure at a location to engage and entrain said liquids, a first manual actuating element movably carried by the body, poppet valve means in said body operable by said element between two control positions and for controlling liquid flow through both of said first and second passages, said valve means in a first of said positions being positioned to at least re-

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strict the liquid flow through said first passage while passing a full flow of said second liquid through said second passage to the nozzle structure, and in the second position to at least restrict the liquid flow through said second passage while passing a full flow of said first liquid through said first passage to the nozzle structure, a second manual actuating element mounted on the body for movement relative thereto and relative to said first actuating element, and an additional valve operable by said second actuating element independently of said first-mentioned valve means for controlling the delivery of compressed air through said third passage.

8. A spray gun as recited in claim 7, in which said first actuating element comprises a cam acting against said poppet valve means.

9. A spray gun as recited in claim 7, in which said valve means is operable in said first position to completely close off liquid flow through said first passage, and in said second position to completely close off liquid flow through said second passage.

10. A spray gun as recited in claim 7, in which said valve means is operable by said first actuating element to a third control position in which it passes a full flow of both of said liquids through said first and second passages to the nozzle structure.

11. A spray gun as recited in claim 10, in which said valve means is operable by said first actuating element to a fourth control position, in which it closes off the liquid flow through both of said first and second passages to the nozzle structure.

ELMORE J. SANDERS.
JOHN ALLEN WIENS.
EDISON J. McCLAVE.

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