May 2, 1939. P. W. HOVEY ET AL 2,156,783

SPRAY GUN

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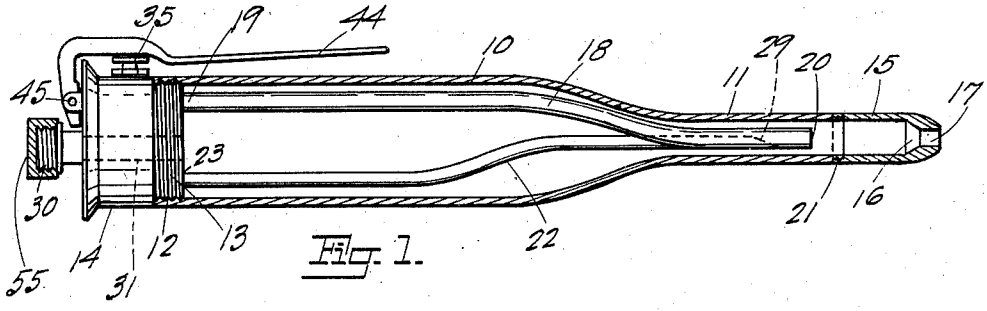


Fig. 1.

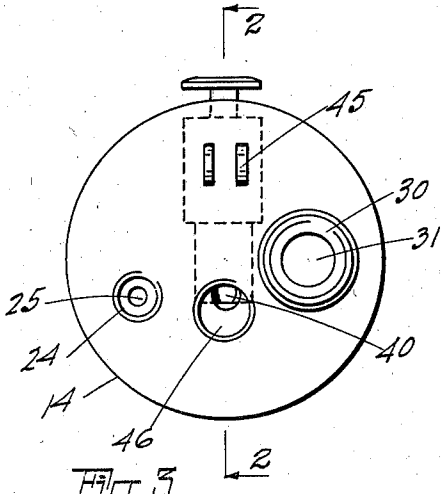


Fig. 3.

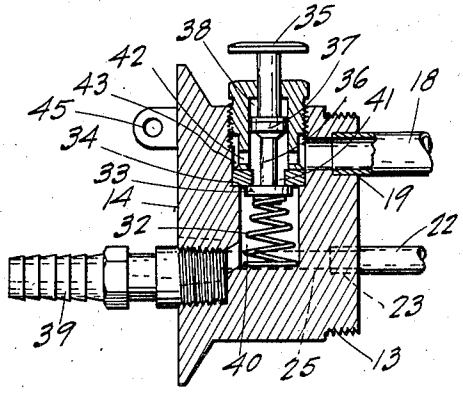


Fig. 2.

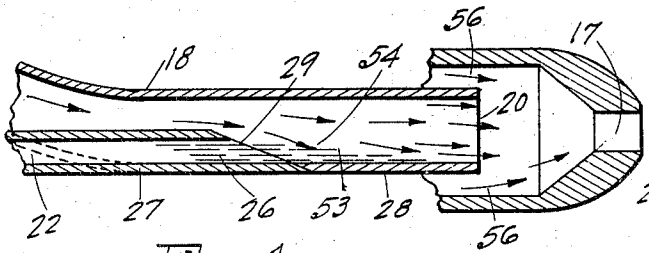


Fig. 4.

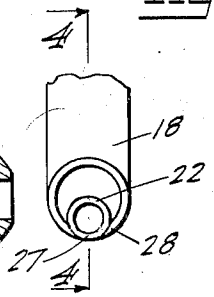


Fig. 5.

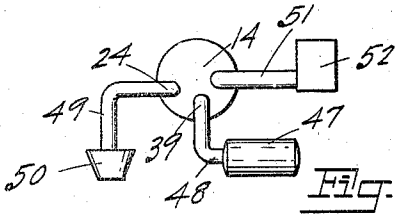


Fig. 6.

INVENTOR.
Paston W. Hovey.
Charles L. Thompson
By Philip A. Friedell
ATTORNEY

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SPRAY GUN

Preston W. Hovey and Charles L. Thompson,
Oakland, Calif.

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10 Claims. (Cl. 299—140)

This invention, a spray gun, is primarily devised for the cleaning of automotive vehicles, although it lends itself to any purpose to which a spray gun can be applied, such as spraying insecticides, paint, chemicals and lacquer, and has the particular advantage over usuall types of spray guns in the fact that any fluid under pressure may be simultaneously mixed and sprayed with either one or two additional fluids, and also in the fact that in paint and similar spraying operations, a more uniform pattern is produced, and the spread of the pattern may be extended or retracted as may be desired, and in the case of car washing, a coarse spray can be produced.

In the case of cleaning of automotive vehicles, naphtha or other solvent is used to remove greases and oils, and the application of the solvent is usually conducted through the medium of rags, sponges, or brushes, using thereby an excess of solvent without obtaining any better results than if just the correct amount for softening of the material was applied, and this spray gun is particularly adapted for properly applying the correct amount of solvent, as well as for the application of wash water in a coarse spray or as a direct, solid flow, and liquid soap or other cleaner can be simultaneously mixed and sprayed or flowed with the water, thereby providing more efficient and rapid cleaning of vehicles.

This invention is also particularly adapted to the spraying of insecticides, since one or two different chemicals in liquid or gaseous form can be simultaneously mixed and sprayed with water or other fluid.

The objects and advantages of the invention are as follows;

First: to provide a spray device which may be used selectively to intermix and simultaneously spray or atomize two or three different fluids at will.

Second: to provide a spray device with a series and compound Venturi system to increase the dispersion and restrict the spread of the pattern.

Third: to provide a spray device with a suction-fluid tip imbedded within a pressure-fluid tip with the suction-fluid tip beveled for initial dispersion from one side of the body of fluid dispersion and restrict the spread of the pattern. of the draw on the fluid.

Fourth: to provide a housing forming an air or vacuum chamber or water conduit at will, and with the housing restricted or necked about the tip assembly to form an annular passage thereabout.

Fifth: to provide a removable, restricting tip for the neck of said housing, whereby the spray pattern may be varied as well as the fineness of the spray by removal or replacement of the removable tip.

Other objects and advantages of the invention will become apparent as the following description is read on the drawing forming a part of this specification, and in which similar reference characters are used to designate similar parts throughout the several views, of which:

Fig. 1 is a longitudinal section through the invention with the head shown in full line.

Fig. 2 is an enlarged section through the head and is taken on a line 2—2 of Fig. 3.

Fig. 3 is an end elevation of Fig. 2.

Fig. 4 is an enlarged section through the combined mixing and atomizing tip and is taken on line 4—4 of Fig. 5.

Fig. 5 is an end elevation of Fig. 4.

Fig. 6 is a diagram illustrating the various connections for the spray gun.

The spray gun consists of a barrel and first fluid lead 10 which is drawn into a neck 11 at one end and internally threaded at its other end as indicated at 12 to form a tight joint with the threaded extension 13 of the head 14. A removable tip 15 is provided with a restricted ejector nozzle or spray tip 16 terminating in an interiorly countersunk, comparatively long ejector passage 17 of uniform cross-section; the combination of neck and tip features first permitting expansion, then gathering or restriction, followed by impingement within the passage 17 previous to escape from the nozzle, therefore producing a very fine mist of restricted and uniform pattern.

Removal of the tip 17 permits greater expansion of the spray pattern and a different and larger size of mist globules results, and the spray gun is particularly suited for car washing, either by flow or spray, without the tip.

The pressure-fluid conduit or second-fluid lead 18 has one end 19 fixed in the head 14 and its other end 20 terminates at a point inwardly from the end 21 of the neck of the barrel 10, and is smaller in diameter, forming an annular fluid passage between the tube 18 and the inside walls of the neck 11, and which forms a venturi for the jet 21 when fluid under pressure is admitted to the barrel.

The suction-fluid conduit or third-fluid lead or tube 22 is of smaller diameter than the tube 18 and has one end 23 fixed in the head 14, and a suitable connection 24 communicates through a passage 25 with the tube 22, and this conduit or tube has its other end 26 laid or imbedded in

the tube 18 with the bottom wall of the tube functioning as bottom wall for both tubes and forming a crescent-shaped passage between the tubes, and terminating within the tube in spaced relation to the end 20 of tube 18, forming the mixing and atomizing zone. It will be noted that a portion of the bottom wall 27 of tube 22 replaces a portion of the bottom wall 26 of tube 18. The terminal end of tube 22 is beveled as indicated at 29, to an angle not less than 135° from the top of the tube in the direction of emergence of fluid from the tube, to present the fluid to a gradual exposure or draw to fluid forced under pressure through the crescent shaped passage and thus more intimately breaking up the fluid for atomization.

A water connection 30 is secured in the head 14 and communicates through a passage 31 directly with the interior of the barrel 10.

A control valve for the compressed air or pressure fluid, of standard make is shown and consists of a spring 32 which urges the valve 33 to its seat 34, and which is released by depressing the button 35 to force the valve away from its seat against the pressure of the fluid, the valve stem 36 seating on a resilient sealing washer 37 which packs the bore 38 against escape of fluid.

When the button 35 is depressed, the air passes through the connection 39 into the spring cage 40 thence through the valve stem passage 41 in the valve seat 34, into the bore 38 between the packing 37 and the valve seat. It then escapes through passages 42 into the annular chamber 43 and thence into tube 18.

The valve is controlled by a finger release lever 44 which is pivoted at 45 to the head 14, and cooperates intermediate its length with the button 35.

The hose connection 39 is screwed into a threaded aperture 46. The hose connections for the various fluid intakes, especially for water and compressed air, are preferably of the quick change types, which are well known in the art.

For cleaning automotive vehicles, the gun may be used either with or without the tip 15, depending on the fineness and force of spray desired, the spray being coarser and having greater impact force without the tip, and a source of compressed air 47 is connected to the connection 39 through the usual flexible hose 48, and another flexible connection 49 communicates between the connection 24 and a supply 50 of solvent, such as naphtha or gasoline, and the hose 51 connecting to a water supply is omitted.

Depression of lever 44 permits the compressed air from the supply 47 to pass through the tube 18, and as it passes the beveled tip 29 it creates a suction on the supply 50 and as the solvent emerges from the tip it is drawn out along the bottom of the mixing tip as it is gradually wiped away and converted into a fine spray from the top surface of the stream downwardly, the beveled side walls protecting the stream at the sides, and the stream not being exposed to the action of the compressed air at the bottom until all the superposed fluid has been atomized.

The stream 53 of solvent is thus simultaneously mixed with the air and atomized, the flow of the compressed air being indicated by the arrow stream 54, and the atomized mixture next eddies in the tip 15 and finally emerges through the restricted nozzle 17, producing a restricted pattern of very fine spray.

If the tip 15 is removed, the atomized mixture emerges from the end 20 of the necked portion of the barrel, and results in a coarser and more scattered pattern.

If the cap 55 is applied to seal the water inlet 30, a different pattern and fineness of spray is produced with increase in vaporization due to the formation of a partial vacuum by the air passing through the neck, and is therefore of particular advantage in painting and lacquering.

If the water connection is left open, air is drawn in through the barrel 10 and about the mixing tip as indicated at 56, increasing the atomization and producing a greater dispersion of the fluid or solvent.

In cleaning vehicles, after the oily and greasy areas have been sprayed, and wiped when necessary, connection can be made to the water supply 52 through the connection 51, and the water used alone or in conjunction with the compressed air, and with or without tip 15, depending on the impact force desired. The connection 49 can either be left open, or can be changed over to a supply 50 of liquid soap or other cleanser, and air, water and soap are then selectable at will for use individually or in any combination of two or three. If water under pressure, and the soap alone are to be used, then it is necessary to remove the tip 15 to permit the necessary suction.

When the compressed air is used in connection with water, the water may be either under pressure or free, and for service stations where water under pressure is not available, this gun offers a distinct advantage, since practically any of these stations have a supply of compressed air.

When compressed air, water and soap are used together, faster and more efficient cleaning results than when water and soap alone are used.

For painting and lacquering, the gun may be used with or without tip 15 and with the connection 30 either open or plugged, making four different spray patterns and degree of atomizations available at will.

For insecticide spraying, any combination of fluids, one of which must be a gas, may be coincidently mixed and sprayed, therefore, the gun is adapted to any kind of spray problem.

The gun is also ideally adapted to spatter work in the smaller sizes, since two colors can be simultaneously atomized, if desired, in two different zones, providing a variegated pattern, or one color can be employed, as for black and white.

It will be understood that variations in construction and arrangement of parts, which variations are consistent with the appended claims, may be resorted to, without detracting from the spirit or scope of the invention, or sacrificing any of the advantages thereof.

We claim:

1. A spray gun, in combination, a pressure-fluid lead terminating in a mixing and atomizing tip; and a suction-fluid lead of smaller diameter laid or imbedded in one side of said mixing and atomizing tip forming a partly encompassing non-circular passage of uniform cross-section for passage of pressure-fluid, and terminating in spaced relation to the end of said tip and within the tip and having its axis parallel with the axis of said mixing and atomizing tip, and an encompassing fluid lead, surrounding said mixing tip and terminating in spaced relation beyond the end of said tip, whereby a plurality of fluids may be coincidently mixed and sprayed at will.

2. A spray gun comprising an air conduit terminating in a mixing and atomizing tip, and a

manually operable release valve for said conduit; a suction conduit having one wall in common with one wall of said air conduit and forming a partly encompassing, crescent-shaped air passage within said mixing and atomizing tip and terminating therein in spaced relation to the terminal end thereof; a barrel forming a handle and surrounding said conduits and terminating in a neck portion encompassing said mixing tip and forming an annular passage therebetween and terminating beyond the end of said mixing tip; an inlet connection for said barrel and an inlet connection for each of said conduits.

3. A structure as claimed in claim 2, the terminal end of said suction conduit being beveled from the top wall in the direction of emergence of fluid, and at an angle of not less than 135° to cause gradual wiping away of fluid as the fluid emerges from said suction conduit by air passing over the top and about the sides thereof through said crescent-shaped passage.

4. In a spray gun, a mixing and atomizing tip comprising an air conduit having a terminal end; a suction conduit of smaller diameter than said air conduit and imbedded into the under side of said air conduit forming a crescent-shaped air passage between the walls of the tubes and terminating within and in spaced relation to the end of said terminal end whereby air passes only about the top and sides of the suction conduit to provide a wiping action on liquid emerging therefrom, to increase the length of the draw on the fluid before complete atomization, thereby creating a spray of globules of liquid of uniform size throughout the extent of the spray pattern.

5. A spray gun comprising a barrel forming a handle and having a removable head at one end and terminating at its other end in a necked portion; an air lead mounted in said head and terminating axially in spaced relation to the end and within the necked portion of said barrel and being of smaller diameter forming an annular fluid passage thereabout; a fluid lead of smaller diameter than said air lead and having one end mounted in said head and its other end axially aligned with said air lead and imbedded into the wall and terminating in spaced relation to the end of said air lead and forming a crescent shaped passage between the walls of the tubes to restrict action of air to a portion of the circumference and increase the length of draw on fluid emerging from said fluid lead by air under pressure passing through said crescent shaped passage; a manually controlled valve having an operating handle axially aligned and closely related to the wall of the barrel and a connection for said air lead; a connection for said fluid lead; and a water connection for said barrel.

6. A structure as claimed in claim 5; said fluid lead terminating in a tip beveled from the top wall in the direction of emergence of fluid therefrom and at an angle of not less than 135°, to increase the length of the draw on emerging fluid by air projected through said crescent shaped passage.

7. A mixing and atomizing tip for spray guns comprising a first tube terminating in a mixing and atomizing portion; a second tube of smaller diameter and imbedded into the mixing and atomizing portion of the first tube, forming a crescent shaped passage between the inner wall of the first tube and outer wall of the second tube and terminating in a beveled end in spaced relation to the end within the mixing and atomizing portion of the first tube, to increase the length of wipe or draw on fluid emerging from the second tube by fluid forced through the crescent shaped passage.

8. A spray gun comprising a barrel necked at one end and having a head sealing the other end, a compressed air delivery tube mounted in said head and extending into said necked portion and terminating in a mixing and atomizing zone within said necked portion in spaced relation to the end thereof; an air connection and a manually controlled valve for said tube; a water connection for said barrel; a cap for sealing said water connection at will; and a fluid delivery tube mounted in said head and extending into said mixing and atomizing zone portion of said compressed air delivery tube and having its bottom wall in common with the bottom wall of said compressed air delivery tube and terminating within said portion in spaced relation to the end thereof; and a fluid connection for said fluid delivery tube.

9. A structure as claimed in claim 8; said fluid delivery tube being of smaller diameter than said compressed air delivery tube and having its bottom wall in common with the bottom wall of said compressed air delivery tube, forming a crescent shaped passage between the tubes and over the end of the fluid delivery tube, said tubes having their axes parallel within the mixing and atomizing zone, said fluid delivery tube having the end thereof beveled at an angle of not less than 135° in the direction of flow of fluid to provide a wiping action confined to the top surface of the fluid emerging from said end, by the air passing through the crescent-shaped passage and over the inclined beveled end of the fluid delivery tube.

10. A structure as claimed in claim 8; and a tip for said necked portion of said barrel, removable and replaceable at will to change the pattern and fineness of spray, an having a bore having a countersunk bottom and being equal in diameter to the diameter of said necked portion, and a comparatively long, restricted ejection passage of uniform cross-section extending from the countersunk bottom of said bore to the end of said tip.

PRESTON W. HOVEY.
CHARLES L. THOMPSON.