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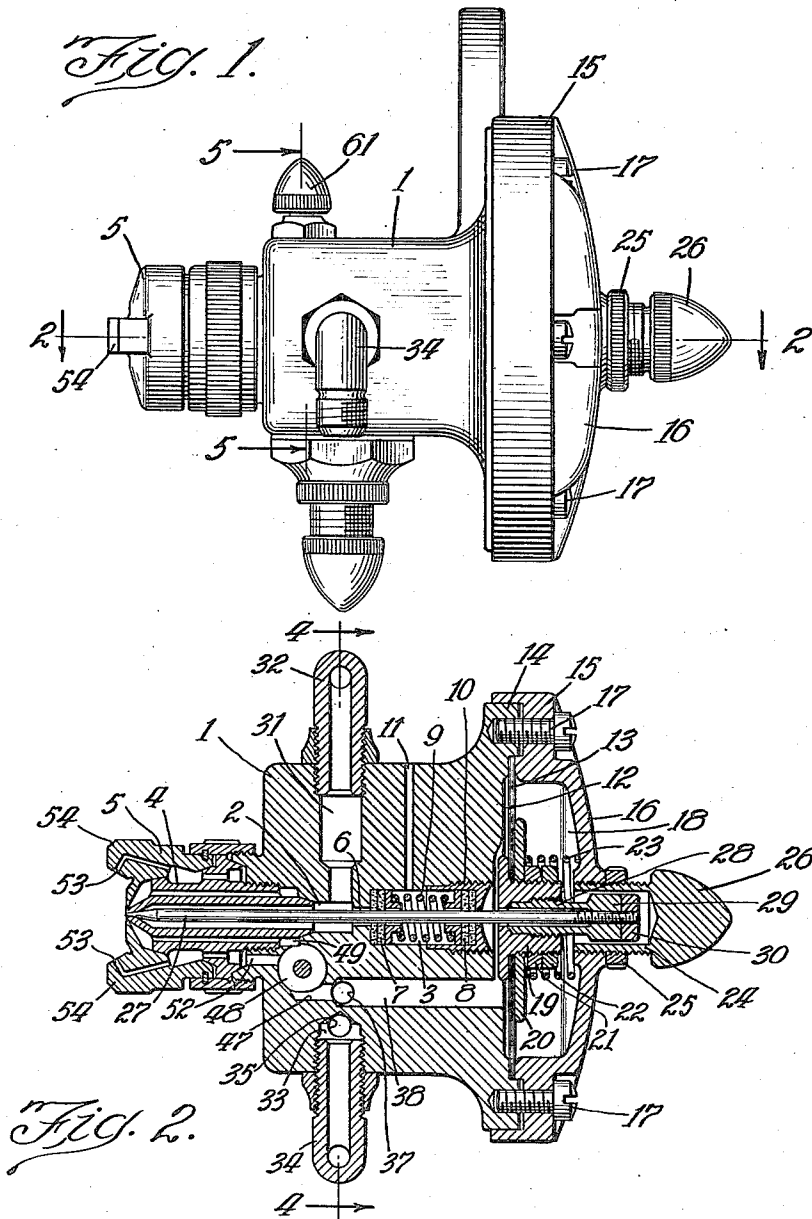
S. BRAMSEN ET AL.

2,239,987

SPRAY GUN UNIT

Filed Aug. 20, 1938

2 Sheets-Sheet 1



Inventors:
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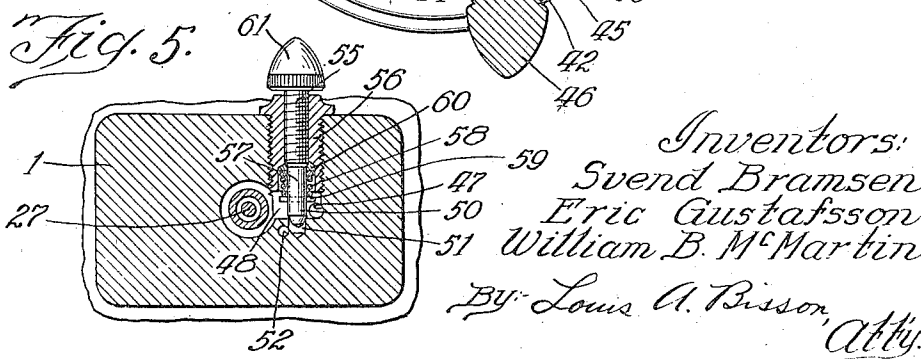
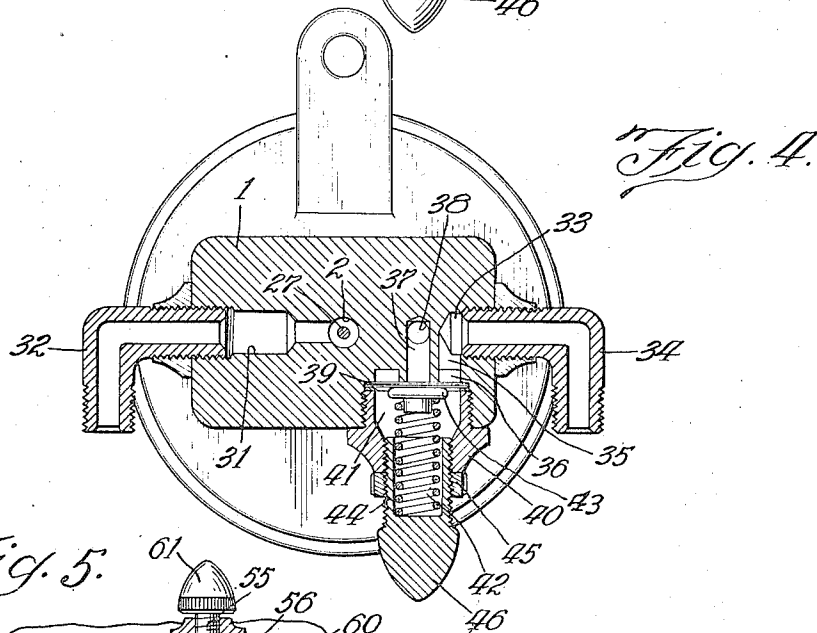
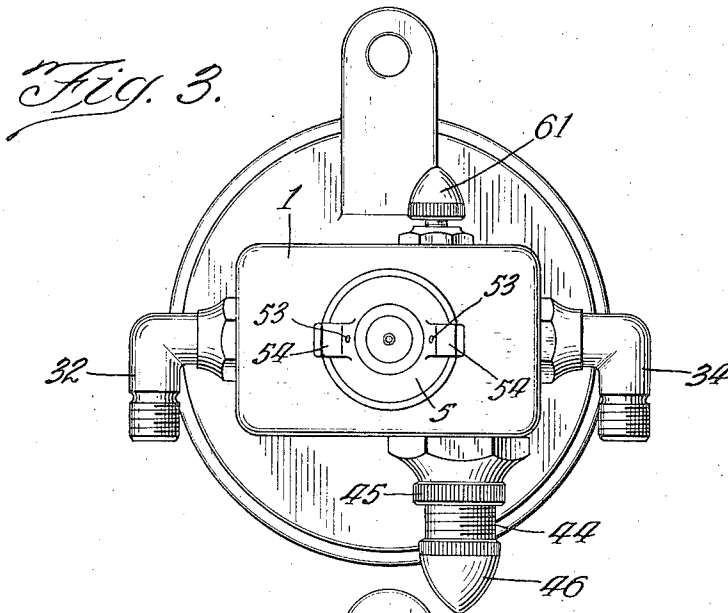
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UNITED STATES PATENT OFFICE

2,239,987

SPRAY GUN UNIT

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ors to Binks Manufacturing Company, Chicago,
Ill., a corporation of Delaware

Application August 20, 1938, Serial No. 225,974

6 Claims. (Cl. 299-140)

The present invention relates to spraying devices of the type known as spray guns and more particularly to a novel unitary construction including all of the operating parts.

Among the objects of the invention is to provide a novel spray gun of unitary construction comprising a body provided with a bore extending through it with the air and material nozzle unit connected to the body at one end of the bore and a diaphragm device connected to the body at the other end of the bore and also so connected to the needle valve for the material nozzle part as to operate it, the needle valve extending through the bore and the material nozzle part, together with separate and independent air passage parts or portions in the body whereby one of the air passage portions of given size leads to the diaphragm means, and the other air passage portion of lesser size leads to the air nozzle part, and also with another passage in the body leading to the bore for supplying the material thereto and to the material nozzle part.

Diaphragm type guns have been limited to a small opening of the needle valve and also to a certain pressure range of air used, principally because of the use of a supply of air of the same pressure for both operating the diaphragm and needle valve and for supplying the air nozzle part with the air. If the liquid and air atomized at low pressure, such pressure frequently was too low for a proper action of the diaphragm, or a piston when a piston is used in lieu of a diaphragm. In other words the pressure was too weak for a correct opening of the needle valve.

By the present invention air at different pressures is used to atomize the material and to operate the needle valve, that is, low pressure air for effecting the atomizing and high pressure air for operating the piston or diaphragm to which the needle valve is connected.

The term "diaphragm" is used herein generically as to comprehend either a piston or diaphragm per se, one being regarded as the equivalent of the other.

Another feature of the invention is the provision in the unit structure of a control means in a high pressure air passage leading to the passage portions for the diaphragm means and the air nozzle part, such as a spring pressed check valve so that air at predetermined pressure will be automatically admitted to the passage portions to the diaphragm device and to the air nozzle part.

Other objects, capabilities, advantages, features, or the like are comprehended by the inven-

tion as will later appear and as are inherently possessed by the invention.

Referring to the drawings:

Fig. 1 is a side view in elevation of a device constructed in accordance with the invention;

Fig. 2 is a horizontal sectional view taken in a plane represented by line 2-2 of Fig. 1 of the drawings;

Fig. 3 is a front view in elevation of the device; Fig. 4 is a transverse sectional view taken in a vertical plane represented by line 4-4 in Fig. 2 of the drawings; and

Fig. 5 is a fragmentary transverse sectional view taken in a vertical plane represented by line 5-5 in Fig. 1 of the drawings.

Referring more in detail to the drawings, the embodiment chosen to illustrate the invention is shown as comprising a body 1 provided with a generally longitudinal bore extending there-through with a forward bore portion 2 opening in the forward part of the body and a rear bore portion 3 opening in the rear part of the body, the bore portions being of different diameters. To the forward end of the body is secured a nozzle unit comprising a material nozzle part 4 in communication with the forward bore portion 2, and an air nozzle part 5. This nozzle unit is of the type and construction more fully disclosed in the copending application of Bramsen and Wahlin, Serial No. 173,365, filed November 8, 1937, as a division of Patent No. 2,102,303, issued December 14, 1937.

The rear bore portion 3 is of greater diameter than the forward bore portion 2 and is connected thereto by a central bore portion 6. In the bore portion 3 is provided a sealing means comprising spaced packing elements 7 and 8 having a spring 9 therebetween for impressing pressure on the packing elements. At the rear end of the bore portion 3 is adjustably screwed a gland plug 10 for holding the sealing means in place and for imposing the desired stress in the spring 9. A relief passage 11 is provided in the body 1 and communicating with the bore portion 3 between the packing elements 7 and 8 to relieve any fluid that might leak past the packing elements into the space therebetween.

The rear end of the body 1 is provided with a recess to form a chamber portion 12 forwardly of a diaphragm 13 clamped at its periphery between the rear rim 14 of the body 1 and the rim 15 of a cap 16 by means of suitable securing elements, such as screws 17, the cap 16 having a chamber portion 18 rearwardly of the diaphragm 13 so that the diaphragm divides or separates the

chamber into chamber portions 12 and 18 as shown.

The central portion of the diaphragm 13 is clamped between the flanged head of a nut 19 and a clamping plate 20 by a clamping nut 21 backed by a lock nut 22 threaded on the shank of the nut 19. A spring 23 is interposed between the plate 20 and the cap 16 to impose a resilient stress or resistance on the diaphragm 13.

The extent of the rearward movement of the diaphragm 13 is determined by the rear end of the nut 19 abutting the forward end of an adjustable stop 24 threaded in the cap 16, a lock nut 25 being used to secure the stop 24 in adjusted position. The stop 24 has a head 26 by which the stop may be turned for adjusting it.

Means is provided for adjustably connecting a needle valve 27 to the diaphragm 13, such means comprising a tubular plug 28 threaded into the shank of the nut 19, and having a head 29 to which the rear threaded end of the needle valve 27 is adjustably screwed, a lock nut 30 being used to secure the parts in adjusted relation. The needle valve 27 extends forwardly through the plug 28, the nut 19, the forward chamber portion 12, the sealing means in the rear bore portion 3, the central bore portion 6, the forward bore portion 2, and the material nozzle part 4.

A material supply passage 31 is provided at one side in the body 1 and leads to and communicates with the forward bore portion 2. At its entry end this passage is connected to a fitting 32 screwed into place as shown and to which may be connected a material supply duct (not shown).

At the other side there is provided in the body 1 an air passage which branches and leads to and communicates with both the chamber portion 12 forwardly of the diaphragm 13 and the air chambers and passages in the air nozzle part. This air passage comprises an entry portion 33 suitably threaded for securement of a fitting 34 to which may be connected an air supply duct (not shown), a passage portion 35 leading to an annular valve chamber portion 36 surrounding a passage portion 37 extending upwardly, and a branch passage portion 38 of given large diameter leading to and communicating with the chamber portion 12 forwardly of the diaphragm 13, and another branch passage portion 47 of smaller diameter and leading to the air valve part.

This air passage entry portion in general includes a check valve for controlling the passage of air under given pressure to the diaphragm means. The check valve mentioned comprises a diaphragm valve element 39 clamped at its margin between a suitable shoulder at the periphery of the annular chamber 36 and the upper end of a valve body 40 screwed into the lower part of the body 1, as shown in Fig. 4. The valve body 40 has a chamber 41 through which extends a spring 42 pressing at one end thereof against a button 43 abutting against the central portion of the valve disc 39, and extending at the other end thereof into an adjustable socket member 44 screw threaded into the lower end of the valve body 40. A lock nut 45 is used to fix the socket member 44 in adjusted position. A knob 46 is provided at the lower end of the socket member 44, by which the member 44 may be turned and adjusted to vary the stress imposed on the spring 42.

The central portion of the valve disc 39 normally closes or seats against the mouth of the passage portion 37 and the remaining annular portion of the valve disc 39 is exposed to the

pressure air in the annular chamber 36. When the pressure of the air acting against the annular portion of the valve disc or diaphragm 39 is sufficient to overcome the force of the spring 42, as adjusted, the valve diaphragm is moved away from the port or mouth of the passage portion 37 to open it and permit passage of the air to the passage portion 38 and chamber portion 12 to act against the diaphragm 13, and hence cause an opening movement of the needle valve 27. The pressure of the air sufficient to open the valve 39 may be termed the "opening" pressure.

As soon as the valve disc 39 opens, the central portion of the disc 39 then is exposed to the air pressure in addition to the annular area therearound, and less pressure is necessary to maintain the valve open. This may be called the "sustaining" pressure. As the air has passed to the passage portions 37 and 38 under at least the sustaining pressure for a given interval of time, then the pressure drops below the sustaining pressure and the spring acts to close the valve 39. This may be called the "closing" pressure. The adjustment of the spring 42 will determine the time of opening of the valve 39.

The air passage portion 47 leads to an air chamber 48 in communication with an annular chamber 49 provided in the rear portion of the nozzle part 4 to supply air under given low pressure to the chambers and passages leading to the tip of the air nozzle part, the passage portion 47 being of such diameter as to throttle the air to the desired low pressure as compared to the higher pressure of air acting through the passage 38 to the diaphragm device.

In the chamber 48 is provided a valve 50 which controls and throttles the air to a chamber 51 (Fig. 5) in communication with an air passage portion 52 leading to the chambers and air passages in the air nozzle part leading to the side ports 53 in the horns 54 (see Fig. 2).

The valve 50 is provided at the end of a threaded stem 55 adjustable in a threaded sleeve 56 screwed in the body 1 (Fig. 5). The stem 55 has a reduced diameter smooth portion 57 around which is a spring 58 acting between a cross pin 59 fixed to the part 57 and a packing or sealing means 60 to prevent escape of air by way of the threaded portion of the stem 55. The latter has a knob 61 by which the stem and valve may be turned for adjusting the opening of the valve 50. This valve means is similar to the valve means shown in Fig. 7 of the Bramsen and Wahlin Patent No. 2,107,686, issued February 8, 1938.

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

Having thus disclosed the invention, we claim:

1. A spray gun unit comprising a body provided with a bore extending therethrough, a spray nozzle unit comprising material and air nozzle parts connected to said body at an end of said bore and with the material nozzle part communicating with said bore, a material passage in said body and leading to said bore, said body at the other end of said bore having a chamber with a diaphragm therein, a needle valve connected to said diaphragm and extending through said bore and into said material nozzle part, an air passage in said body and comprising an entry portion,

a branch portion of given size leading to one side of said diaphragm, and another branch portion of smaller size leading to said air nozzle part, a diaphragmatic type of check valve in said entry portion for operating automatically by air under pressure in said entry portion to control the passage of air to said branch portions in given time relation.

2. A spray gun unit comprising a body provided with a bore extending therethrough, a spray nozzle unit comprising material and air nozzle parts connected to said body at an end of said bore and with the material nozzle part communicating with said bore, a material passage in said body and leading to said bore, said body at the other end of said bore having a chamber with a diaphragm therein, a needle valve connected to said diaphragm and extending through said bore and into said material nozzle part, an air passage in said body and comprising an entry portion, a branch portion of given size leading to one side of said diaphragm, and another branch portion of smaller size leading to said air nozzle part, a spring pressed valve in said entry portion for controlling the passage of air under pressure in given time relation and operated by pressure air therein for supplying air at given pressure to said branch portions, said second branch portion acting to throttle the air to the air nozzle part.

3. A spray gun unit comprising a body provided with a bore extending therethrough, a spray nozzle unit comprising material and air nozzle parts connected to said body at an end of said bore and with the material nozzle part communicating with said bore, a material passage in said body and leading to said bore, said body at the other end of said bore having a chamber with a diaphragm therein, a needle valve connected to said diaphragm and extending through said bore and into said material nozzle part, an air passage in said body and comprising an entry portion, a branch portion of given size leading to one side of said diaphragm, and another branch portion of smaller size leading to said air nozzle part, a spring resisted diaphragm type of check valve in said entry portion for controlling the passage of air under pressure in given time relation and operated by pressure air therein for supplying air at given pressure to said branch portions, said second branch portion acting to throttle the air to the air nozzle part.

4. A spray gun unit comprising a body provided with a bore extending therethrough, a spray nozzle unit comprising material and air nozzle parts connected to said body at an end of said bore and with the material nozzle part communicating with said bore, a material passage in said body and leading to said bore, said body at the other end of said bore having a chamber with a diaphragm therein and with said diaphragm dividing said chamber into chamber portions, a spring in a chamber portion and pressing against said diaphragm on one side thereof, a sealing means in said other end of said bore, a needle

valve connected to said diaphragm and extending from the other side thereof and through said other chamber portion, said sealing means, into said bore and said material nozzle, an air passage in said body and comprising an entry portion, a branch portion of given size leading to said last mentioned chamber portion, and another branch portion of smaller size leading to said air nozzle part, a spring resisted diaphragm type of check valve in said entry portion for controlling the passage of air under pressure in given time relation and operated by pressure air therein for supplying air at given pressure to said branch portions, said second branch portion acting to throttle the air to the air nozzle part.

5. A spray gun unit comprising a body provided with a bore extending therethrough and having a forward bore portion and a rear bore portion, a spray nozzle unit connected to the forward end of said body and comprising material and air nozzle parts with the material nozzle part communicating with said forward bore portion, a material passage provided in said body and leading to said forward bore portion, a diaphragm device at the rear end of said body and having a chamber with a force resisted movable diaphragm therein and providing a chamber part forwardly of said diaphragm and at the rear end of said body, sealing means in said rear bore portion, a needle valve connected to said diaphragm and extending through said sealing means and said forward bore portion and into said material nozzle part, an air passage provided in said body and extending rearwardly to said chamber part forwardly of said diaphragm and forwardly to said air nozzle part, a check valve forming part of said body and having inlet and outlet passages with the outlet passage leading to said air passage, a force resisted diaphragm in said check valve for controlling passage of air from said inlet passage to said outlet passage, said air inlet passage being provided in said body.

6. A spray gun unit comprising a body, a nozzle unit connected thereto and comprising material and air nozzle parts, material and air passages provided in said body and leading to said material and air nozzle parts, a needle valve for controlling the material passage, a diaphragm device operable by air under pressure and having a force resisted movable diaphragm connected to the needle valve to operate it, a pressure air passage provided in the body and operatively connected to the diaphragm device, a diaphragm type of check valve forming part of said body and having an outlet passage leading to said air passages, an inlet passage provided in said body and leading to said check valve, and a force resisted diaphragm in said check valve for controlling the passage of pressure air from said inlet passage to said outlet passage in given time relation.

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