Nov. 11, 1947. J. ALLAN 2,430,697

VALVE FOR SPRAY GUNS

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Fig. 2.

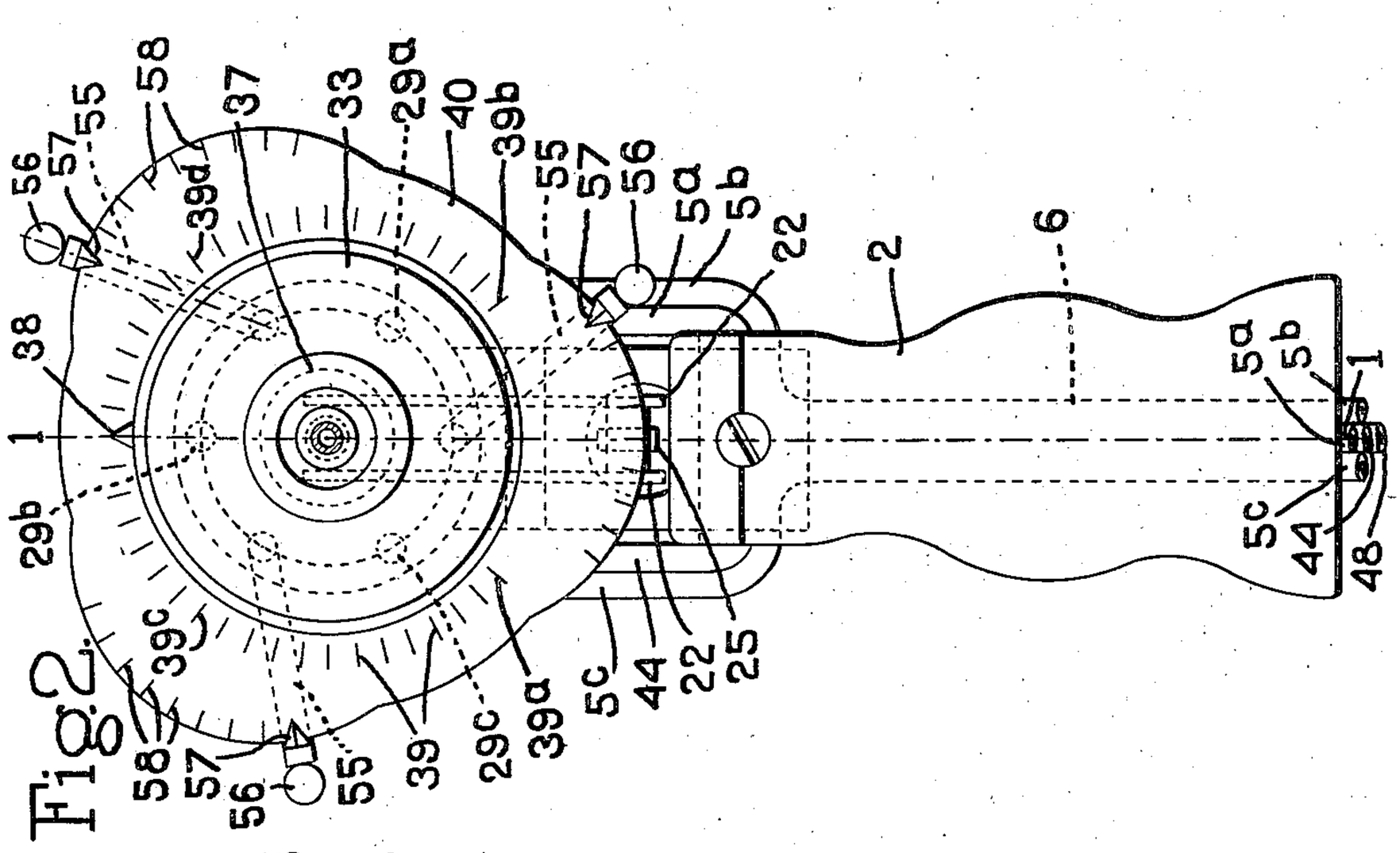
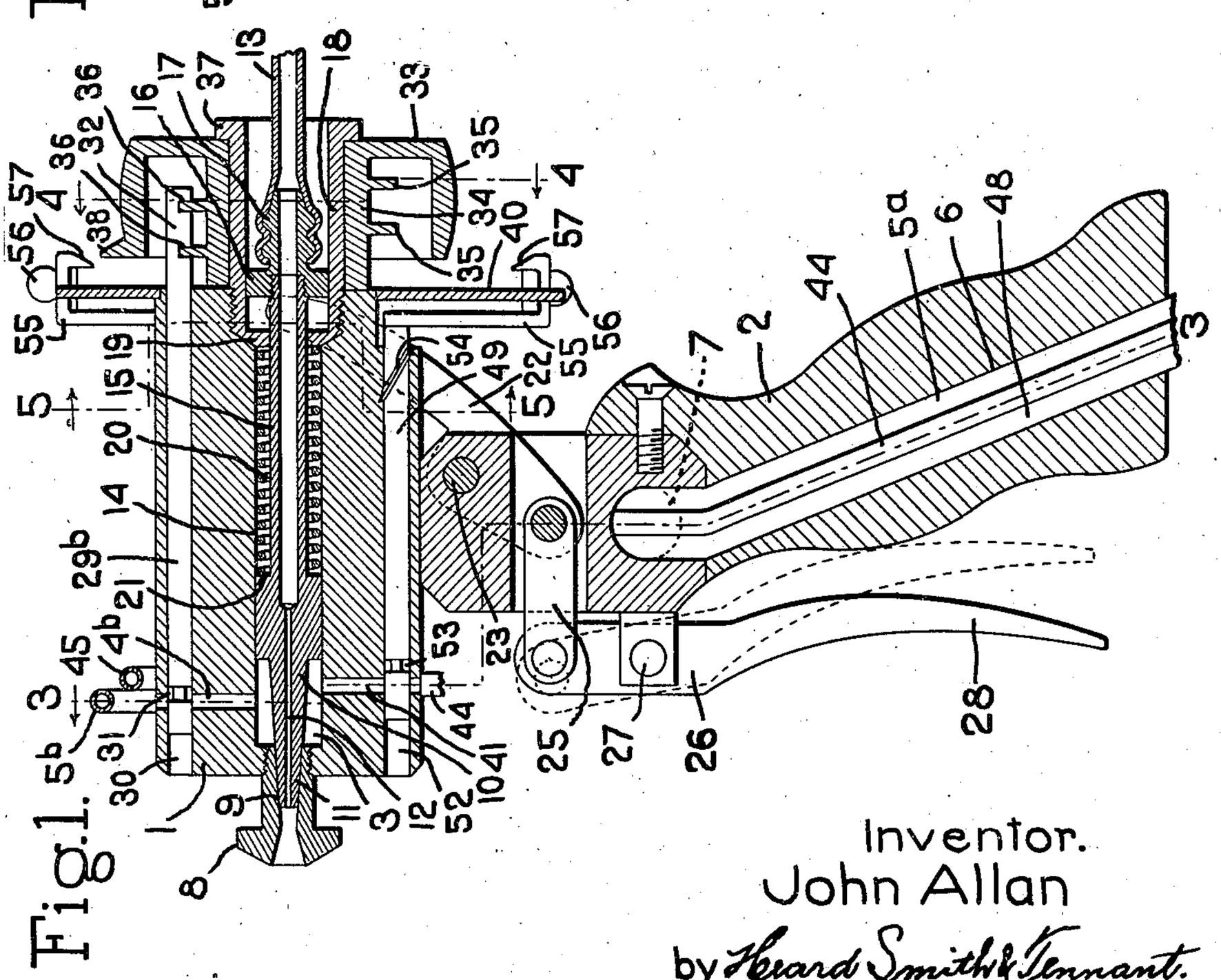


Fig. 1.



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Nov. 11, 1947. J. ALLAN 2,430,697

VALVE FOR SPRAY GUNS

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Fig.3.

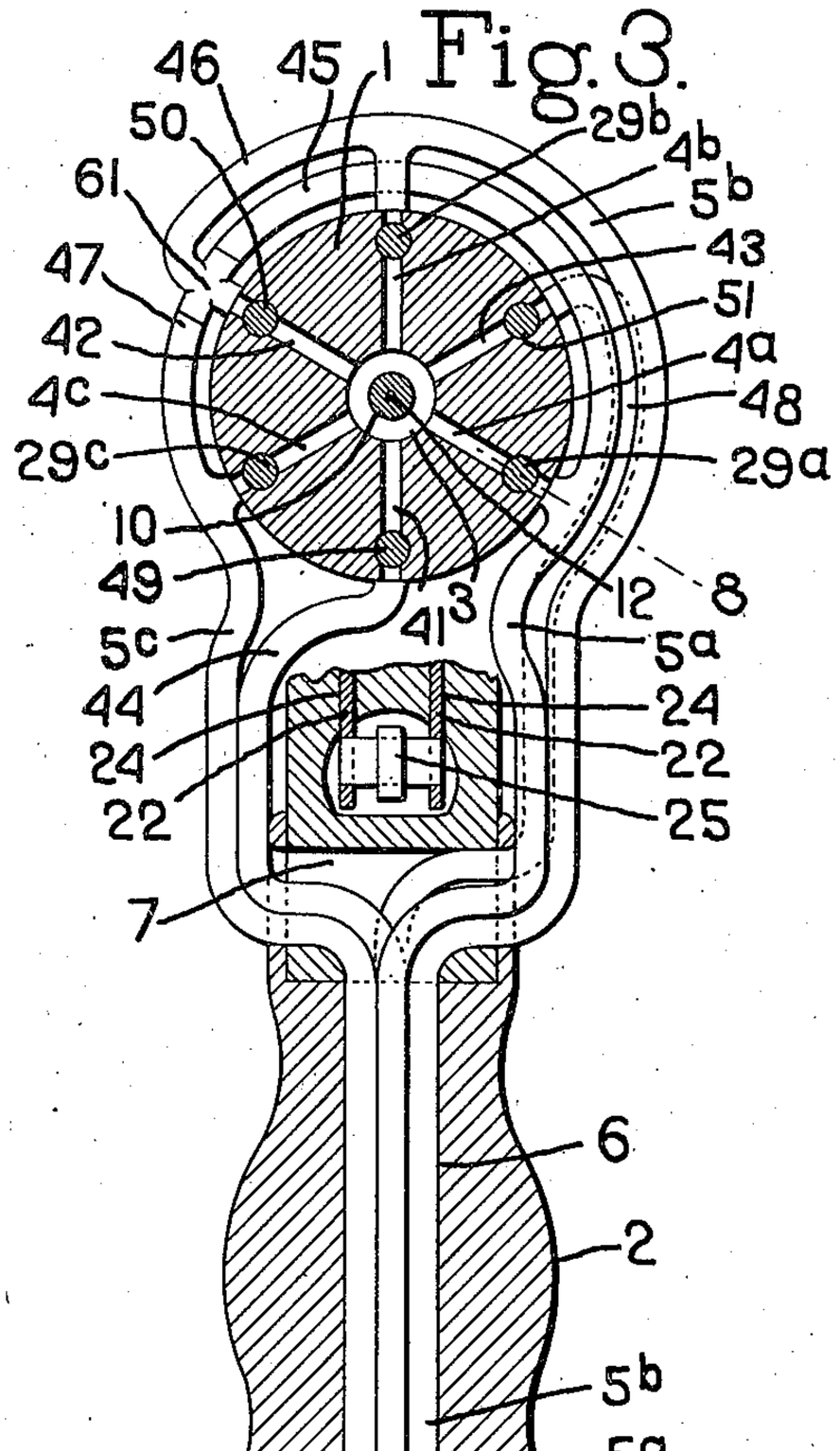


Fig.4.

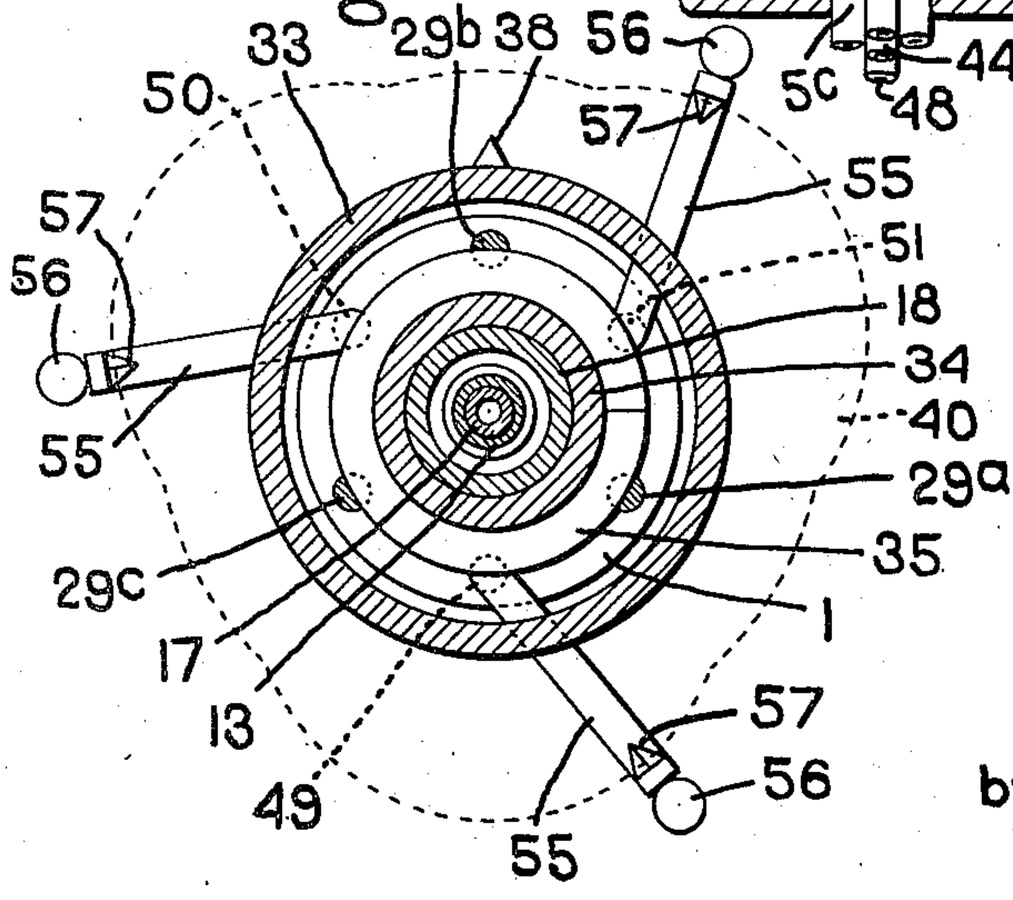
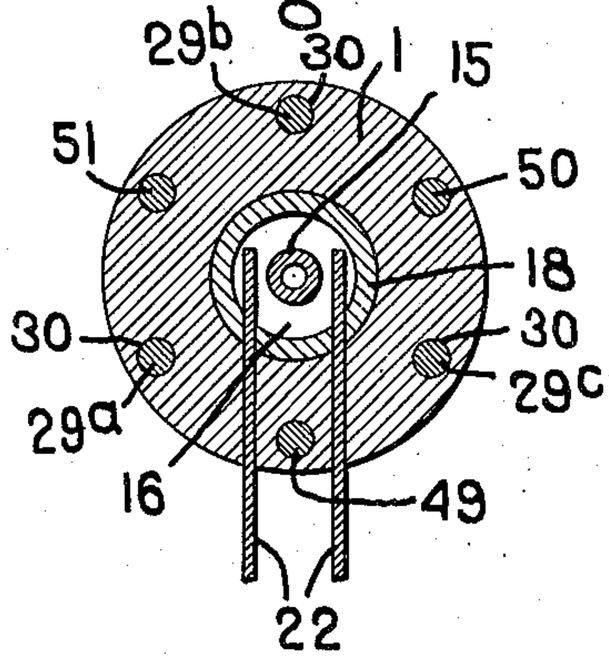


Fig.5.



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VALVE FOR SPRAY GUNS

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Fig.6.

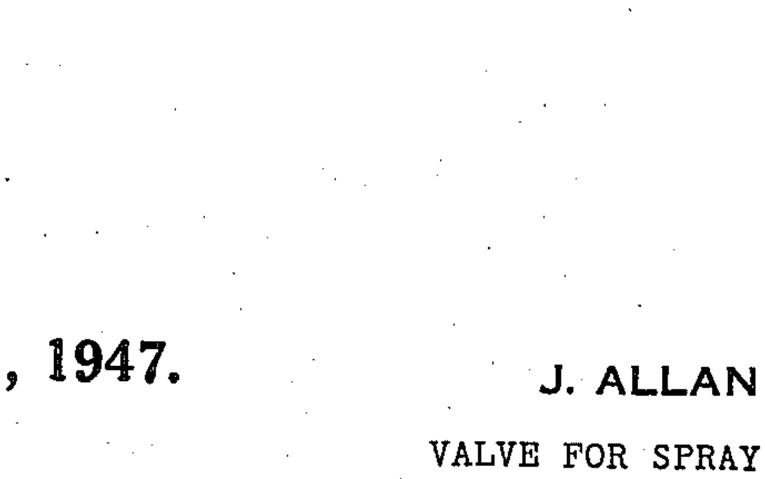


Fig.7.

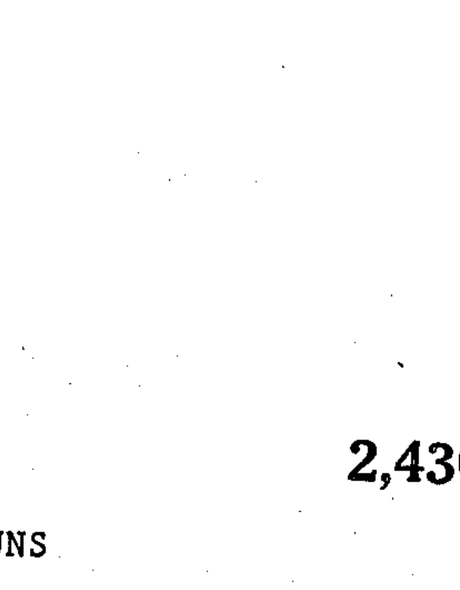


Fig.8.

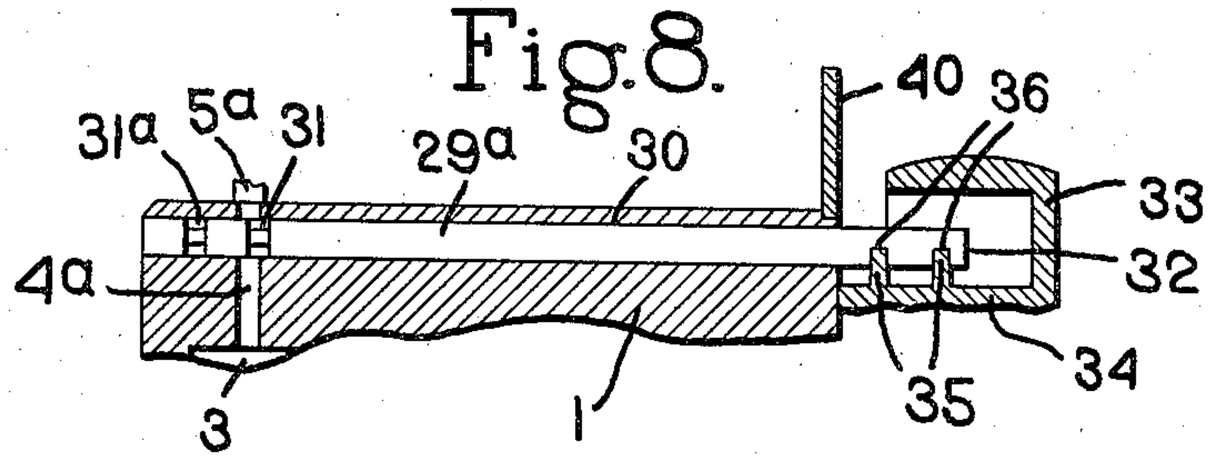


Fig.9.

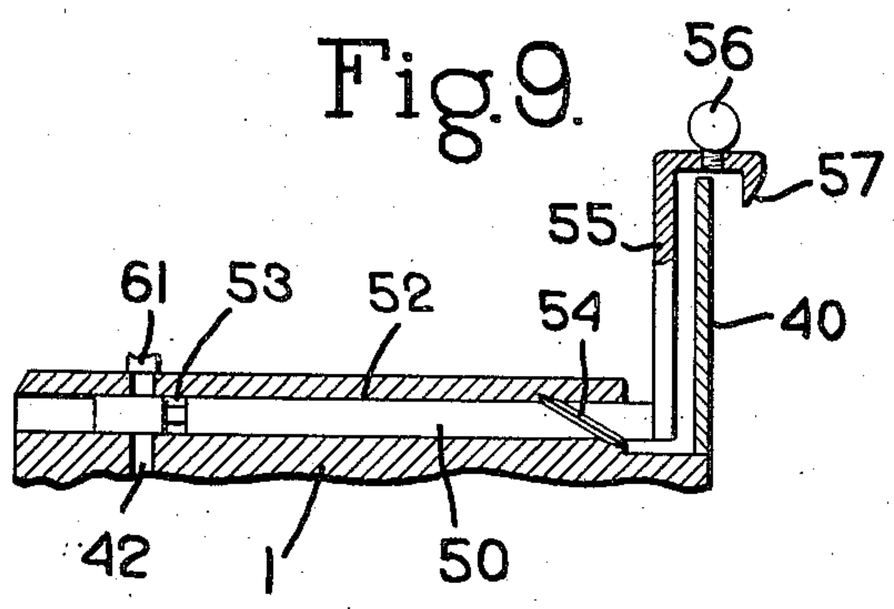
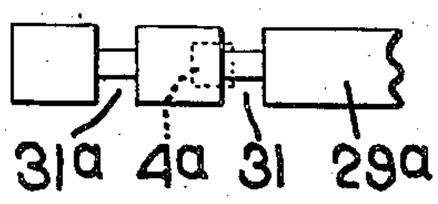


Fig.15.



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VALVE FOR SPRAY GUNS

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Fig.10.

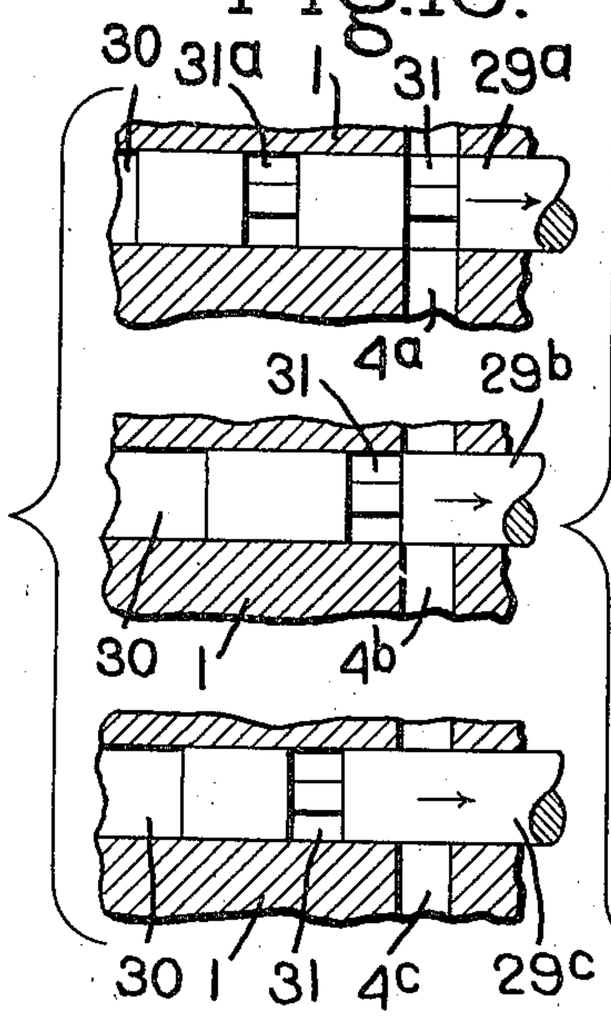


Fig.11.

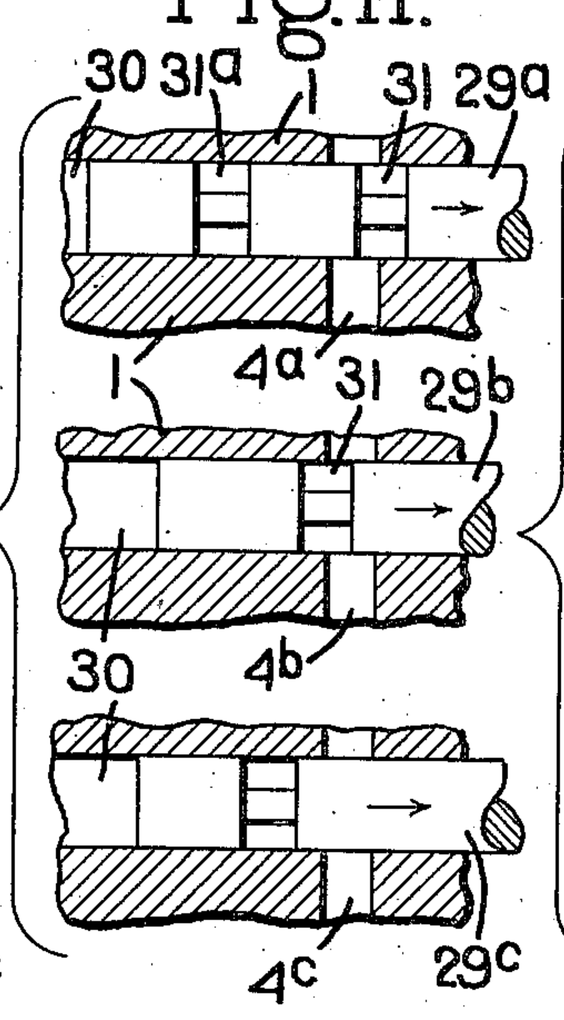


Fig.12.

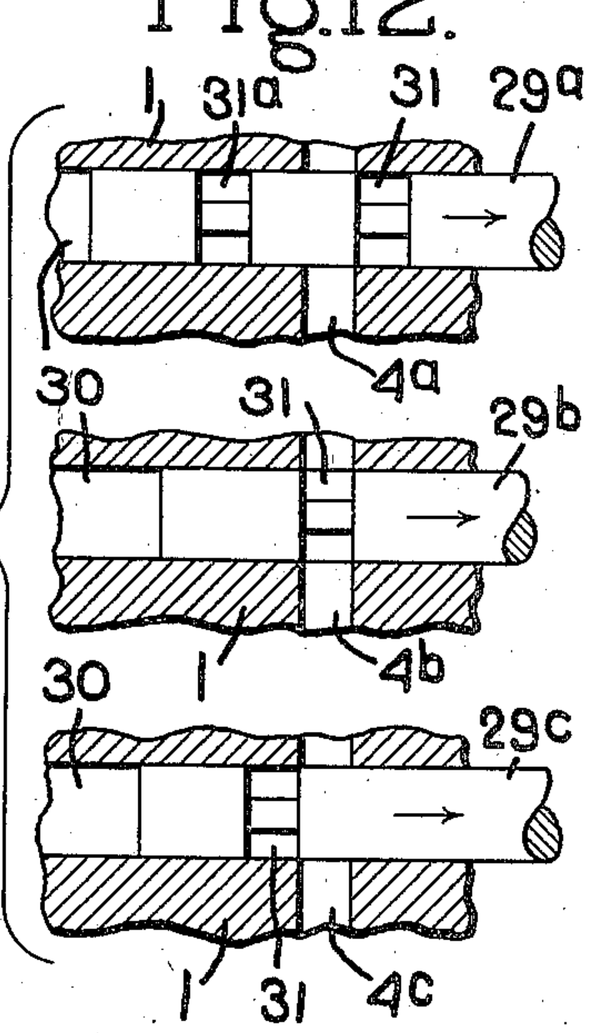


Fig.13.

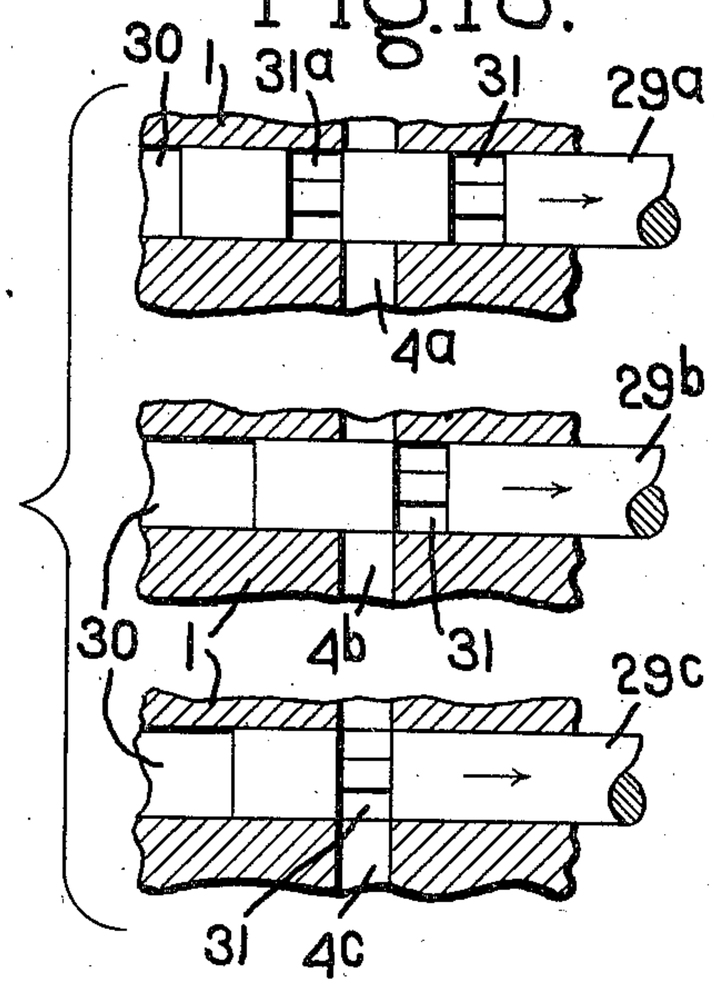
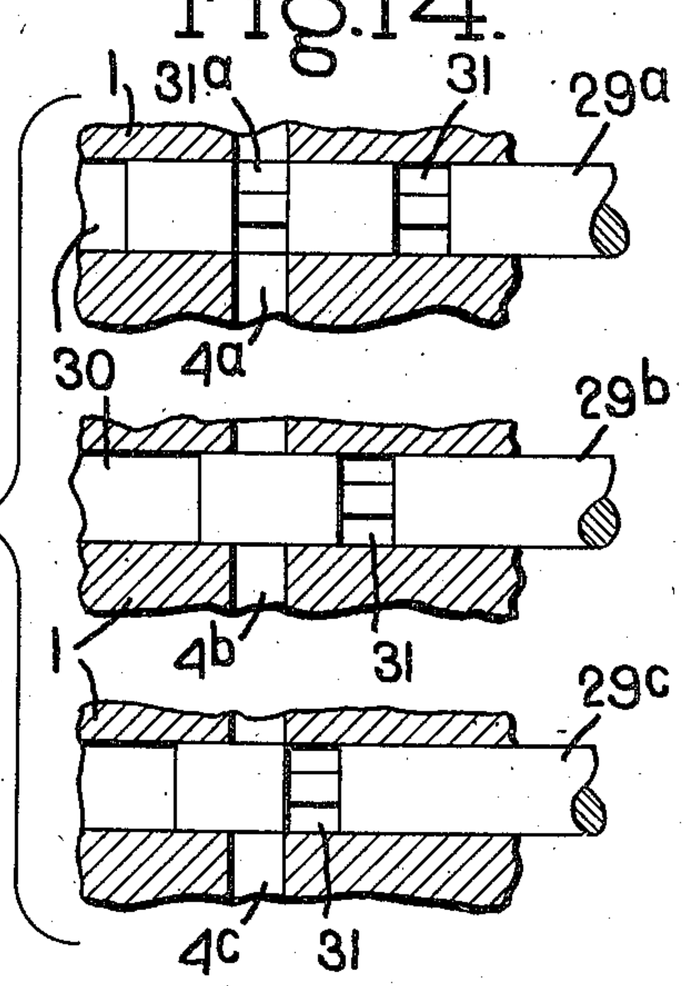


Fig.14.



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Patented Nov. 11, 1947 2,430,697

UNITED STATES PATENT OFFICE

2,430,697

VALVE FOR SPRAY GUNS

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Application April 21, 1943, Serial No. 483,850

3 Claims. (Cl. 277—18)

1

This invention relates to spray guns and especially to spray guns designed for mixing paint and spraying it on to a surface to be covered.

Most theories regarding colors are based on the proposition that there are three primary pigment colors and that all other colors can be produced by mixing two or more of the primary colors in the proper proportions.

The basis of the so-called "Kellogg color theory" is that the three primary pigment colors are yellow, turquoise (blue-green) and magenta. By mixing these primary colors in different proportions, a wide variety of pure colors can be produced ranging from yellow to turquoise, from turquoise to magenta, and from magenta to yellow.

Tints of any of these various colors can be obtained by adding white to the color, and shades of any color (that is, a color tending toward black) can be secured by adding the complementary color to the mixture, or a black color which results when all three primary colors are mixed in equal proportions.

It is one of the objects of the present invention to provide a novel valve for a spray gun which draws its supply from separate containers, one of which contains paint of one primary color, another of which contains paint of another primary color and another of which contains paint of the third primary color, which spray gun is so constructed that any desired mixture of the three primary colors for producing a spray of any desired color may be obtained by the manipulation of a single control element.

A further object of the invention is to provide a valve for a spray gun such as above referred to which is equipped with means for adding a controlled amount of white from a separate container to any color for which the control element has been set thereby to produce a tint of said color.

Another object of the invention is to provide such a valve for a spray gun with means by which controlled amounts of a mixture containing equal proportions of the three primary colors can be added to any color for which the control element is set, thereby to produce a shade of said color.

A still further object of the invention is to provide various improvements in valve for a spray gun which will be hereinafter set forth.

In order to give an understanding of the invention, I have illustrated in the drawings a selected embodiment thereof which will now be described, after which the novel features will be pointed out in the appended claims.

In the drawings:

2

Fig. 1 is a vertical sectional view through a spray gun embodying my invention taken on the line 1—1 Fig. 2.

Fig. 2 is a view of the spray gun looking from the right in Fig. 1.

Fig. 3 is a section on substantially the line 3—3 Fig. 1.

Fig. 4 is a section on the line 4—4 Fig. 1.

Fig. 5 is a section on the line 5—5 Fig. 1.

Fig. 6 is a fragmentary sectional view showing the spray-controlling valve.

Fig. 7 is a view partly in section of the control element.

Fig. 8 is a fragmentary sectional view on the line 8—8 Fig. 3.

Fig. 9 is a fragmentary sectional view showing one of the auxiliary valves.

Figs. 10–14 are fragmentary sectional views showing different adjusted positions of the three primary valves that control the flow of the primary colors to the mixing chamber of the spray gun.

Fig. 15 is a fragmentary view illustrating the relation between the inlet ports and the valve port.

My improved spray gun comprises a body member 1 which is herein shown as cylindrical in shape and which is mounted on and carried by a suitable handle element 2. This body element is provided with a mixing chamber 3 and with a plurality of radially arranged inlet ports leading into said mixing chamber. Three of these ports may be considered as primary ports in that their function is to supply to the mixing chamber the three primary colors. These three primary ports are indicated at 4*a*, 4*b*, and 4*c* respectively. The primary port 4*a* has a delivery pipe 5*a* connected thereto which leads to a container containing the primary color yellow. The primary port 4*b* connects with a pipe 5*b* which leads to a container containing the primary color magenta, and the primary port 4*c* connects at its outer end with a supply pipe 5*c* leading to a container containing turquoise color.

For convenience in handling the spray gun, the handle element 2 is provided with a central opening 6 through which the supply pipes 5*a*, 5*b*, and 5*c* extend, said handle having the side outlets or openings 7 through which the supply pipes pass on their way to the primary ports.

The body 1 is provided at its end adjacent the mixing chamber 3 with a spray nozzle 8 through which the paint mixture in the mixing chamber is delivered as a spray. This spray nozzle comprises a bushing member having a tapered throat

9 which communicates with the mixing chamber 3.

The delivery of the spray from the nozzle 8 is controlled by a spray-controlling valve member 10 which is formed with a tapered nose 11 that fits the tapered throat 9. This valve member 10 is provided with an axial air delivery passage 12 which communicates with an air supply pipe 13 leading to a source of compressed air supply.

The valve member 10 operates in an axial bore 14 with which the body member 1 is provided, the outer end of the bore constituting the mixing chamber 3. The body of the valve member 10 fills and has a sliding fit in the bore and is provided with a tubular stem portion 15, the outer end of which carries a head 16 provided with a nipple 17 to which the end of the air supply pipe 13 is attached. This head 16, which is in the form of a disk, operates in a sleeve member 18 which is secured to the right-hand end of the body member 1 (see Fig. 1). The inner end of the sleeve member has the inwardly directed annular flange 19 through which the valve stem 15 extends. A spring 20 which encircles the stem 15 and is confined between the flange 19 of the sleeve 18 and the shoulder 21 on the valve member serves to yieldingly hold the valve in its closed position shown in Fig. 1. When the valve is moved toward the right in Fig. 1 so as to partially open the throat 9 of the nozzle member as shown in Fig. 6, then the force of the stream of compressed air issuing from the passage 12 will draw paint from the mixing chamber 3, and this paint will be delivered from the nozzle 8 as a spray.

The valve 10 is manually controlled, and for this purpose, I have provided a two-armed lever 22 pivoted to the handle at 23, the two arms of which extend through slots 24, with which the handle is provided, into position to engage the head 16 on either side of the valve stem 15. The lower end of this two-armed lever is connected by a link 25 to the upper end of a lever 26 that is pivoted to the handle at 27. The lower end 28 of this lever is in a position to be engaged by the fingers of the operator while he is grasping the handle 2, and by applying pressure to the lower end 28 of the lever 26 thereby to swing it from the full line position Fig. 1 toward the dotted line position, the two-armed lever 22 will be actuated to move the valve 10 backwardly against the action of the spring 20. The extent to which the valve is opened is determined by the amount of movement which the operator gives to the valve actuating lever 26.

Each of the primary ports 4*a*, 4*b*, and 4*c* is controlled by a primary valve, and all of the valves are in turn controlled by a single control member so that by manipulating this single control member, the primary valves may be opened and closed in a regular sequence.

Associated with the control member is an index disk graduated in terms of the different colors ranging from yellow to magenta, from magenta to turquoise, and from turquoise to yellow, so that by setting the control member in accordance with any particular marking in this graduation, the valves will be set to produce a color corresponding to such graduation marking.

It is expected that a chart showing the range of colors will be furnished with the spray gun, and this chart will indicate the setting of the control member necessary to produce any of the specified colors on the chart.

The primary valves controlling the primary

ports 4*a*, 4*b*, and 4*c* are indicated at 29*a*, 29*b*, and 29*c*. Each valve is in the form of a rod or piston extending parallel to the axis of the body member and operating in a cylindrical bore 30 formed therein. The body of each valve member fills the bore, but each valve member is provided with a portion of reduced diameter constituting a port 31 which can be brought into and out of register with the corresponding primary port. The inlet ports are preferably made square in cross section as indicated in Fig. 15. The advantage of this is that the co-operation of the square inlet port with the port 31 of the valve provides for uniform increase in the quantity of paint delivered when the valve is opened at a uniform rate, and also a uniform decrease in the quantity of paint delivered as the valve is closed at a uniform rate.

Each valve member extends through the body 1 and projects beyond the right-hand end thereof as shown at 32.

The control member by which these primary valves 29*a*, 29*b*, and 29*c* are operated is indicated at 33, and it is shown in the form of a knob which is rotatively mounted on the sleeve member 18. The hub 34 of this knob is provided with a spiral rib 35 which makes at least two turns about the hub, and the projecting ends 32 of the valve members are formed with notches 36 in which the peripheral portion of the spiral rib 35 is received.

The knob 33 is held from movement in an axial direction by means of the flange 37 with which the sleeve 18 is provided, and the turning movement of the knob, therefore, will serve to give the various primary valves a movement in the direction of their axes, thereby to open and close the various primary ports.

The primary valve 29*a* which controls the port 4*a* through which the yellow paint is delivered is provided with two ports 31 and 31*a* as shown in Fig. 8, the reason for which will presently appear.

The knob 33 is provided with an index projection 38 which co-operates with graduation marks 39 formed on an indication disk 40 which is secured to the right-hand end of the body 1. These graduation marks 39 start at the point 39*a* and terminate at the point 39*b* (see Fig. 2). The arrangement of the cam or spiral rib 35 and its connection with the primary valves are such that when the index pointer 38 is at the end 39*a* of the graduation mark, the three primary valves will be in the position shown in Fig. 10 in which the primary valve 29*a* controlling the supply of the yellow color to the mixing chamber is situated with its port 31 registering with the inlet port 4*a*, while the other two primary valves 29*b* and 29*c*, which control the supply of the magneta and turquoise colors to the mixing chamber, are in positions to close the primary inlet ports 4*b* and 4*c*. As the control knob is turned clockwise in Fig. 2, the valves will all be advanced toward the right, and such advancing movement will gradually close the port 4*a* and will gradually open the port 4*b* as shown in Fig. 11.

When these two ports 4*a* and 4*b* are partially opened, then both the yellow color and the magenta color will be delivered to the mixing chamber, and the paint which is sprayed from the nozzle will be a mixture of these two primary colors.

If the port 4*b* is only slightly opened and the port 4*a* correspondingly closed, then the color delivered from the spray gun will be one in which

yellow is predominating over the magenta. When the valves are in the relative position shown in Fig. 11 in which each port is half open, then the two colors yellow and magenta will be delivered in equal quantities to the mixing chamber, and the resulting mixture will be an orange color.

When the control member has been moved to bring the index projection **38** opposite the graduation **39***c*, then the port **4***a* will have been fully closed, and the port **4***b* will be fully open, the port **4***c* also being closed as shown in Fig. 12. In this position, the pure magenta color will be delivered from the spray gun. When the control member is moved further in a clockwise direction to bring the index projection **38** opposite the graduation **39***d*, then the valves will have been advanced into the position shown in Fig. 13 in which the ports **4***a* and **4***b* are closed and the port **4***c* is fully opened. This will result in delivery of the turquoise color from the spray gun. When the control knob **33** has been turned still further in a clockwise direction Fig. 2 to bring the index projection **38** opposite the last graduation **39***b*, then the valves will have been moved into the position shown in Fig. 14 in which the inlet ports **4***b* and **4***c* are closed, and the inlet port **4***a* is open by reason of the fact that the port **31***a* of the valve **29***a* is in a position to register with the inlet port **4***a*. This will result in the delivery of the yellow paint from the spray gun.

It will be understood, of course, that when the control member 33 is adjusted so as to bring the index projection **38** into any position between the graduation marks **39***a* and **39***c*, the two inlet ports **4***a* and **4***b* will each be partially open so that a mixture of the yellow and magenta colors will be delivered to the mixing chamber, the proportion of the mixture depending upon the position of the control member.

Similarly, when the control member is adjusted so as to bring the projection **38** into any position between the graduation marks **39***c* and **39***d*, then both the inlet ports **4***b* and **4***c* will be open and a mixture of magenta and turquoise will be delivered to the mixing chamber. The relative amounts of these two colors which are thus delivered depends upon the position into which the knob is adjusted with the index finger in the zone between the graduation marks **39***c* and **39***d*.

When the control member is adjusted into a position in which the index projection **38** is located between the graduation marks **39***d* and **39***b*, then the inlet ports **4***c* and **4***a* will both be partially opened, and turquoise and yellow paint will be delivered to the mixing chamber, the proportionate amounts of each color which is thus delivered depending upon the position of the index finger between said graduation marks **39***d* and **39***b*.

If a chart is provided showing the whole range of colors from yellow to magenta, from magenta to turquoise, and from turquoise back to yellow again and this chart is provided with notations corresponding to the notations which the graduation marks **39** may bear, then any particular color on the chart can be delivered from the spray gun by simply adjusting the knob **33** so as to bring the indication point **38** into register with the corresponding graduation mark **39**.

I have referred above to a provision for producing tints and shades of any desired color, a tint of any color being produced by mixing white with said color and a shade of any color being produced by mixing a small quantity of black with said color.

For the purpose of producing such tints and shades, the body **1** of the spray gun is provided with a plurality of auxiliary ports leading into the mixing chamber **3**, three such ports being indicated at **41**, **42**, and **43**. The port **41** has communication with a supply pipe **44** which extends through the handle **2** and leads to a container containing white paint.

The auxiliary port **42** communicates with three branch pipes **45**, **46**, and **47** that connect with the supply pipes **5***a*, **5***b*, and **5***c* respectively so that the port **42** may receive equal quantities of the three primary colors, yellow, turquoise, and magenta. The auxiliary port **43** is shown as communicating with a supply pipe **48** which leads through the handle **2** and extends to a container containing some nonpigment color or paint, such as aluminum paint or gold paint, or paint thinner which can be introduced to clean the gun.

Each of the auxiliary ports **41**, **42**, and **43** is controlled by an auxiliary valve, these valves being indicated at **49**, **50**, and **51** respectively. These three auxiliary valves are alike in their construction, and each is capable of independent manual manipulation.

Each auxiliary valve is in the nature of a cylindrical rod operating in a bore **52** with which the body member **1** is provided, and each valve is capable of moving in the direction of its length and is formed with a port **53** which may be brought into and out of register with the corresponding auxiliary port. For giving each auxiliary valve its lengthwise movement, it is provided with a screw threaded portion **54** which engages interior screw threads with which the bore **52** is provided, and the end of the rod is formed with an arm **55** by which the valve can be turned. Turning movement of the valve will operate through the screw threads to give the valve a longitudinal movement.

The screw threads **54** on the valve and the complementary threads in the bore have such a pitch that a partial turning movement of each valve will be sufficient to open and close it.

Each valve actuating arm **55** is provided at its outer end with a hand piece **56** by which it may be operated, and it is also provided with an index pointer **57** which cooperates with graduation marks **58** formed on the disk member **40** for the purpose of indicating the degree to which the valve is opened by any swinging movement of its handle **55**.

If after setting the control knob **33** to produce any desired color, it is desired to produce a tint of said color, then the auxiliary valve **49** will be opened more or less so as to admit to the mixing chamber the necessary amount of white color to produce the tint desired. When the control member and the auxiliary valve have been thus properly set, the color that is delivered from the spray gun when the actuating lever **26** is operated will be a tint of the color determined by the setting of the primary valves, the depth or strength of the tine being determined by the setting of the auxiliary valve **49**.

If on the other hand, it is desired to produce a shade of any color, then the control knob **33** will be set to produce the desired color and the auxiliary valve **50** will then be open more or less so as to deliver into the mixing chamber through the auxiliary port **42** a black color obtained by

the equal mixture of the three primary colors. The depth of the shade produced will, of course, depend upon the degree of opening of the auxiliary valve 50.

The auxiliary valve 51 will be used if it is desired to change the character of the paint by introducing into the mixing chamber some non-pigment paint, or this auxiliary valve may be employed for admitting a cleansing fluid to the mixing chamber if it is desired to clean the gun.

I claim:

1. A paint mixing device for a spray gun comprising a body member having three primary color inlets for supplying paint to a mixing chamber, a separate piston valve for each primary color inlet, a rotary control knob common to all of said valves, a connection between said knob and each of the separate valves whereby each valve can be opened or closed by rotation of the knob, said body having an additional inlet for supplying paint to the mixing chamber, a valve controlling said additional inlet, and means separate from the knob to operate said valve.

2. A paint mixing device comprising a body member having three primary color inlets through which paint may be delivered to a mixing chamber, means for supplying each primary color inlet with paint of the corresponding primary color, a separate piston valve controlling each primary color inlet, a rotary control knob common to all of said valves, connections between said knob and each valve whereby rotation of the knob gives the valves a sliding movement to open and close the valves, said body having an additional inlet for supplying paint to the mixing chamber, means for supplying said additional inlet with paint of the three primary colors in equal proportions, a valve controlling said additional inlet, and means separate from the knob to operate said valve.

3. A paint mixing device for a spray gun comprising a body member having three primary color inlets through which paint may be delivered

to a mixing chamber, means for supplying each primary color inlet with paint of the corresponding primary color, a separate piston valve controlling each primary color inlet, a rotary control knob common to all of said valves, connections between said knob and each valve whereby rotation of the knob gives the valves a sliding movement to open and close the inlet ports, said body having a plurality of additional inlet ports for supplying paint to the mixing chamber, means for supplying one of said additional inlet ports with paint of the three primary colors in equal quantities, an auxiliary valve controlling each said additional inlet port and means separate from the knob to operate said auxiliary valves independently.

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