May 4, 1965 F. W. WAHLIN ETAL 3,181,798

AIRLESS SPRAY GUN HAVING SPRAY AND VALVE SAFETY MEANS

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Fig. 1.

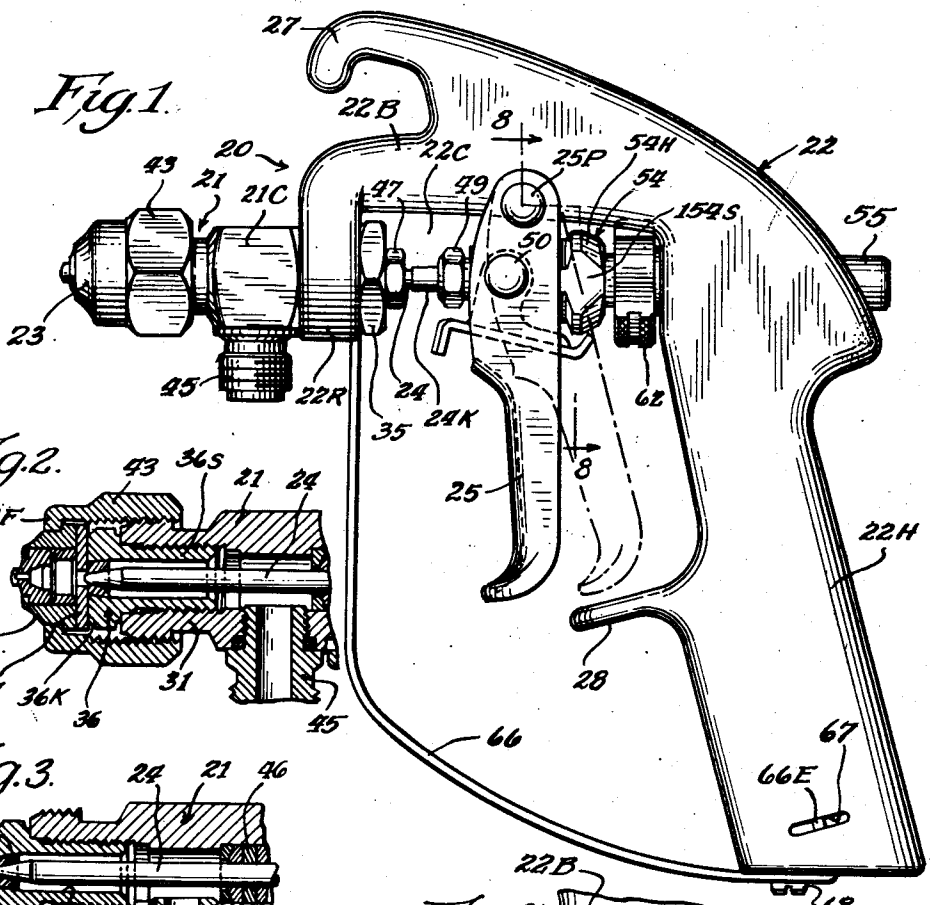


Fig. 2.

Fig. 3.

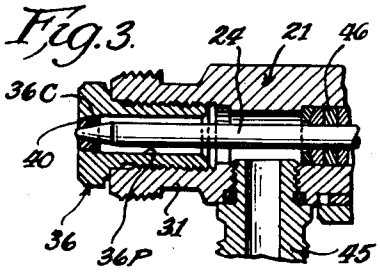


Fig. 4.

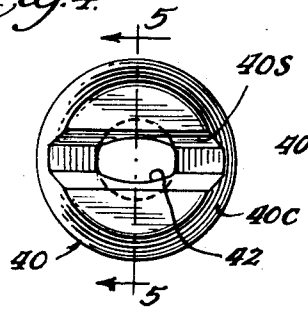


Fig. 5

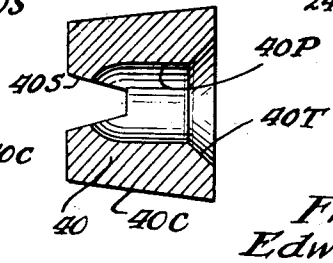
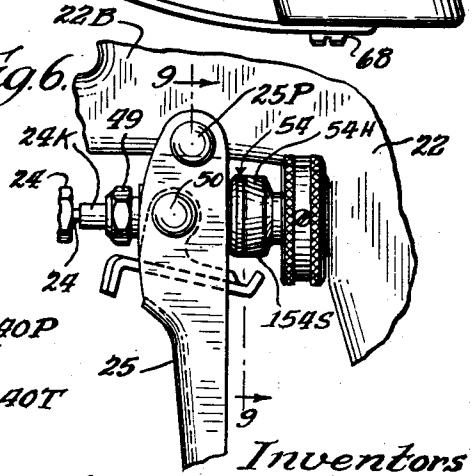


Fig. 6.



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Fig. 7.

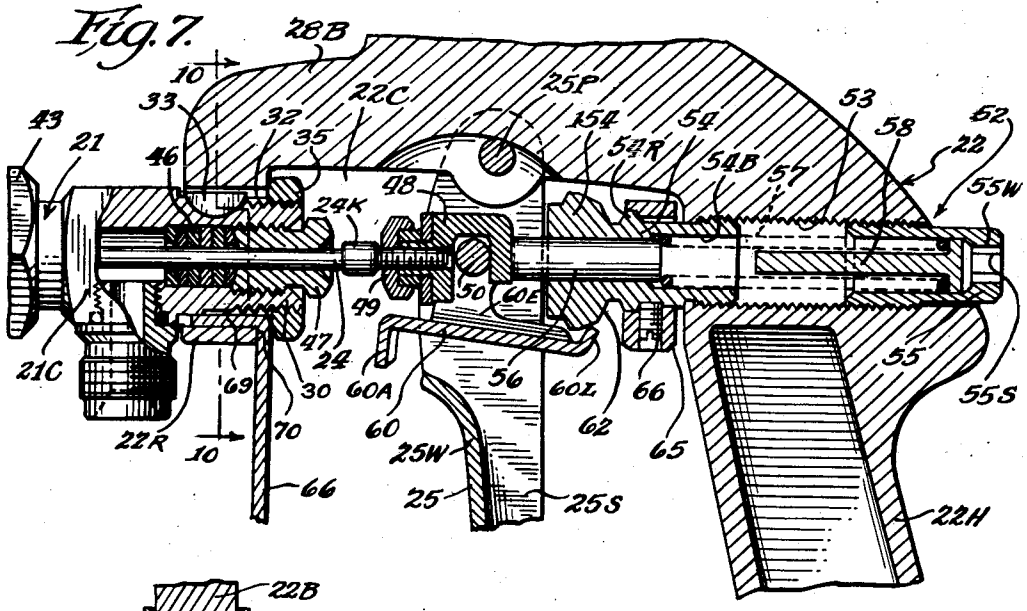


Fig. 8.

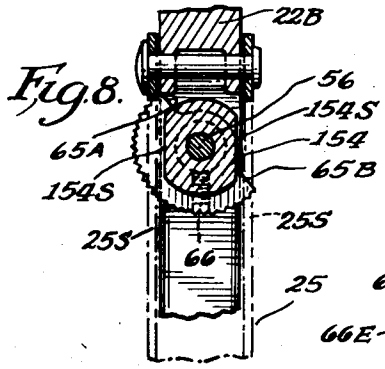


Fig. 12.

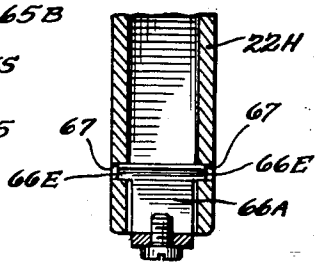


Fig. 11.

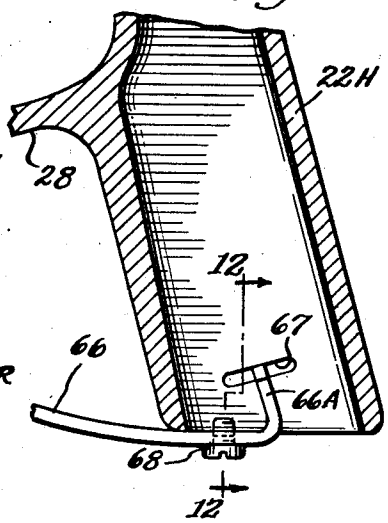


Fig. 9.

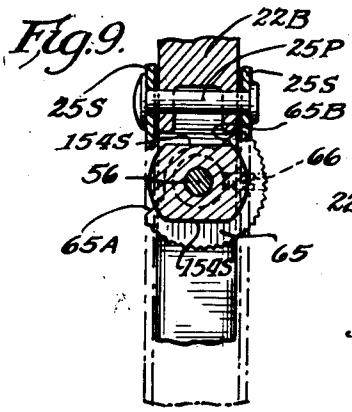
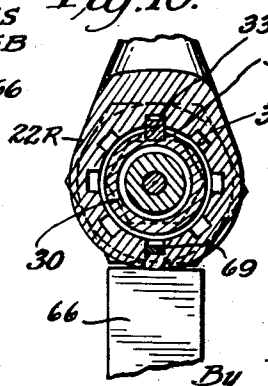


Fig. 10.



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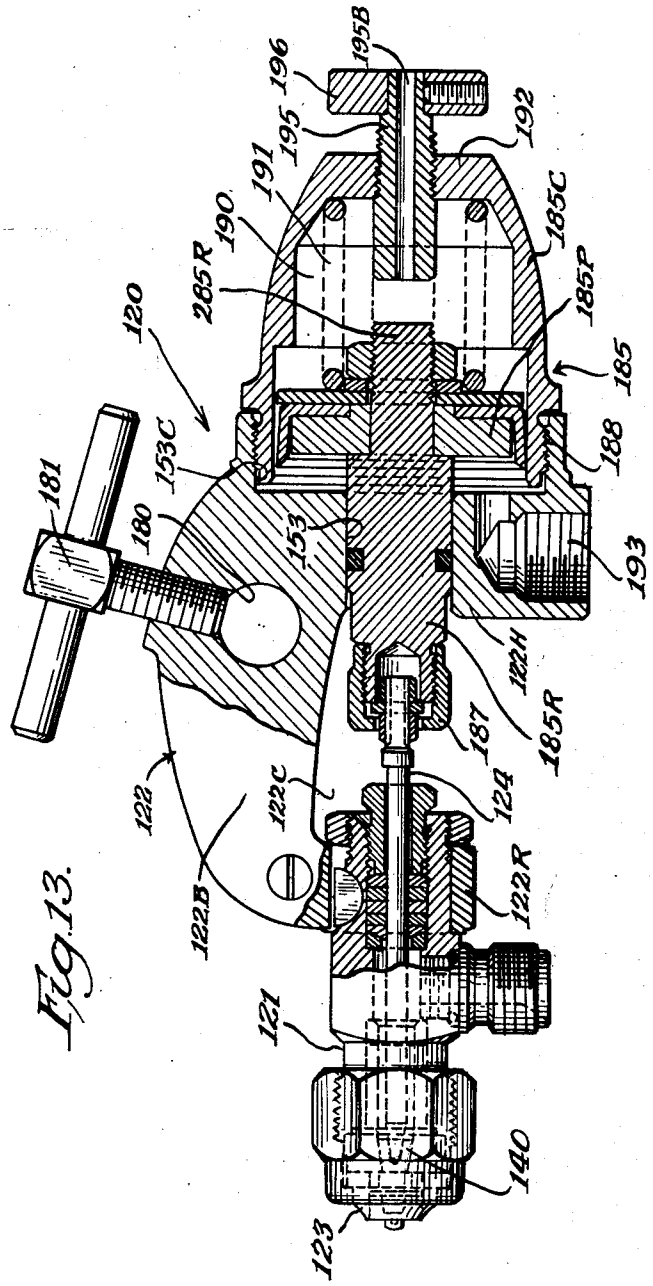


Fig. 13.

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AIRLESS SPRAY GUN HAVING SPRAY AND VALVE SAFETY MEANS

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Filed July 18, 1962, Ser. No. 210,746
15 Claims. (Cl. 239—499)

This invention relates to airless spray guns for spray liquids such as paint and particularly the invention relates to safety means in such spray guns.

Airless spray guns when used for spraying surface coating material such as paint are usually operated at extremely high pressures which may range from 600 to as high as 4000 pounds per square inch, and it has long been recognized that liquid discharged at such pressures and in extremely small solid streams is highly dangerous because at close range such streams will readily penetrate the skin and flesh of the user. Such liquid penetration is in itself dangerous, and any toxic characteristics of the liquid add to such danger.

The primary object of this invention is to prevent injury of personnel by inadvertent discharge of high pressure liquid from such airless spray guns.

In such airless spray guns a normally closed valve is opened either manually or by power means when liquid is to be discharged, and further objects of this invention are to enable inadvertent opening of the control valve to be prevented, and to effectually dissipate the force of discharged liquid in the event that such discharge does occur.

In airless spray guns the control valve is located immediately behind the removable spray tip of the gun, and in practice it is found that when the spray tip is removed for cleaning or replacement, the chances for inadvertent opening of the control valve are the highest. It is therefore a more specific object of this invention to provide means in association with the control valve of such a spray gun for diffusing liquid that may be inadvertently discharged under such conditions.

Other and further objects of the present invention will be apparent from the following description and claims, and are illustrated in the accompanying drawings, which, by way of illustration, show preferred embodiments of the present invention and the principles thereof, and what is now considered to be the best mode in which to apply these principles. Other embodiments of the invention embodying the same or equivalent principles may be used and structural changes may be made as desired by those skilled in the art without departing from the invention.

In the drawings:

FIG. 1 is a side elevational view of a hand-held airless spray gun embodying the features of the invention;

FIG. 2 is an enlarged vertical sectional view through the spray tip and valve mechanism of the gun;

FIG. 3 is a view similar to FIG. 2 with the spray tip removed;

FIG. 4 is a left hand end elevational view of the valve seat member;

FIG. 5 is a longitudinal cross sectional view taken substantially along the line 5—5 of FIG. 4;

FIG. 6 is a fragmentary view similar to a portion of FIG. 1 and showing the trigger disabling means in its effective position;

FIG. 7 is an enlarged and somewhat fragmental vertical sectional view of the gun;

FIG. 8 is a fragmental cross sectional view of the trigger disabling means in its ineffective position, the view being taken along the line 8—8 of FIG. 1;

FIG. 9 is a view similar to FIG. 8 showing the trigger disabling means in its effective position, the view being taken along the line 9—9 of FIG. 6;

FIG. 10 is a vertical sectional view taken substantially along the line 10—10 of FIG. 7, and showing details of attachment of the trigger guard at its forward end;

FIG. 11 is a fragmentary vertical sectional view showing details of attachment of the trigger guard;

FIG. 12 is a fragmentary vertical sectional view taken substantially along the line 12—12 of FIG. 11; and

FIG. 13 is a side elevational view taken partially in vertical section and showing an alternative embodiment of the invention.

For purposes of disclosure the invention is herein illustrated as embodied in a hand-held airless spray gun 20 as illustrated in FIGS. 1 to 12, and as illustrated in FIG. 13, the invention is embodied in an automatic or remotely controlled airless spray gun 120.

The airless spray gun 20 as shown particularly in FIG. 1 of the drawings comprises a forward barrel 21 that is carried on the forward end of a main body 22, and at the forward end of the barrel 21, a spray tip 23 is detachably mounted from which the liquid such as paint is discharged in the desired pattern under high pressure under control of a valve rod 24 that extends rearwardly from the barrrel 21 and is adapted to be actuated from its normal closed position by means including a trigger 25. The body 22 of the spray gun 20 is of the usual die cast construction having a horizontal top bar portion 22B with a downwardly projecting mounting ring 22R at its forward end, and a downwardly projecting pistol grip handle 22H at its rear end. This relationship of the mounting ring 22R and the handle 22H provides an intermediate space 22C beneath the top bar 22B, and it is within this space 22C that the trigger 25 is located along with the operating connections for the valve rod 24. At its upper forward end the top bar 22B has a forwardly projecting hook of the conventional kind, while on the forward side of the handle 22H, a forwardly projecting finger 28 is provided beneath the path of the trigger 25 to aid the user in supporting and manipulating the gun.

The barrel 21 has an enlarged squared central section 21C with reduced nipple portions 30, FIG. 7, and 31, FIG. 2, extending respectively in rearward and forward directions, and the rearwardly extending nipple 30 projects through the central opening of the mounting ring 22R for supporting the barrel 21 on the main body 22 of the gun. As shown particularly in FIGS. 7 and 10, the mounting ring 22R of the main body has an annular opening therethrough which has a plurality of longitudinal key slots 32 formed in equally spaced relation, and the nipple 30 has a key-receiving recess 30R in which a Woodruff key 33 is located. The key 33 may thus be engaged with any one of the key slots 32 so as to locate the barrel 21 in any one of several rotative positions with respect to the gun body 22, and this arrangement is employed so that the paint spray connection may be brought in from selective direction. When the nipple 30 has been inserted rearwardly into the mounting ring 22R with the key 33 in engagement with the desired key slot 32, a securing nut 35 is tightened into position on the rearwardly extending end of the nipple 30 as shown in FIGS. 1 and 7.

The other or forwardly projecting nipple 31 is shown in detail in FIGS. 2 and 3, and this nipple has external threads and internal threads for purposes that will hereinafter appear. At the forward end of the nipple 31, a sleeve-like valve seat support 36 is mounted. The support 36 has a head portion 36H that is in the form of a nut and an externally threaded sleeve 36S, and this sleeve is screwed rearwardly into the internal threads of the nipple 31 in a fixed position as shown in FIGS. 2 and 3. At its forward end or left hand end as shown in FIGS.

2 and 3, the central passage 36P of the member 36 is tapered inwardly as a conical surface 36C to serve as a mounting for a separately formed valve seat member 40.

The valve seat member 40 has a conical external surface 40C that tapers toward a small forward end and is complemental to the surface 36C, and this member 40 has an internal longitudinal passage 40P that is originally formed as a blind bore with a round inner or forward end as will be evident in FIG. 5. Near its rear or right hand end, as shown in FIG. 5, the passage 40P is formed with a tapered surface 40T, and the surface 40T and the surface of the passage 40P near the right hand end as shown in FIG. 5 are lapped so that at the juncture of these surfaces, an accurate annular region of engagement is provided for the forward end of the valve rod 24 as will be discussed.

At its other or forward end, the valve seat member 40 has a transverse slot 40S formed diametrically thereof, and this slot has diverging sides and a flat bottom as will be evident in FIGS. 4 and 5. The slot 40S extends for a considerable distance into the valve seat member 40 so as to intersect the passage 40P, and the liquid that passes through the passage 40P must escape through the somewhat oval opening 42 and then must pass out of the slot 40S. Liquid under high pressure escaping through an opening having the form described tends, when discharged directly to the atmosphere, to diverge into a spray-like form rather than emerging as a solid stream, and this is important as will hereinafter be discussed in certain situations that arise in the handling of spray guns of the general character herein disclosed.

The outer screw threads of the forwardly extending nipple 31 serve to receive a cap 43 which may be threaded thereon to hold the spray tip 23 in place. The cap 43 has an inturned flange 43F that engages an outward flange on the rear portion of the spray tip 23, and normally in the use of structures of this general character, a centrally apertured washer or disc 44 is put in position between the valve seat member 40 and the spray tip 23.

When the spray tip 23 is removed for cleaning or replacement, the cap 43 must of course be removed, and at the same time the washer or disc 44 is released so that the forward end of the barrel 21 appears as shown in FIG. 3. In other words, the outer end of the valve seat 40 is at this time exposed, and when the forward end of the valve seat member 40 is thus exposed, the transverse slot 40S is effective to cause dispersal or spray-like discharge of high pressure liquid that may emerge from the opening 42 of the valve seat member.

The squared central portion of the barrel 21 also serves to receive a separately formed nipple 45 that constitutes the liquid supply connection, this nipple 45 being threaded radially through one side of the squared body 21C in a sealed relationship, as shown in FIGS. 2 and 3.

As mentioned hereinabove, the valve rod 24 is moved toward and away from the valve seat member 40, and to enable this to be accomplished the valve rod 24 extends to the right as shown in FIGS. 1 to 3 and 7 and through a packing gland 46 that is tightened by means of a packing nut 47. At its right hand or rear end, the valve rod 24 has a threaded portion that may be threaded into the adjacent side of a U-shaped member 48. This U-shaped member is utilized in associating the rear end of the valve rod 24 with the trigger 25. A lock nut assembly 49 is provided on the threaded rear end of the valve rod 24 for locking the rod and the U-shaped member 48 together. An enlarged knurled portion 24K is provided on the valve rod to facilitate its association with the U-shaped member 48.

To provide for association of the U-shaped member 48 with the trigger 25, it will be noted that the trigger 25 is formed as a sheet metal stamping having a rather elaborately formed lower portion including a web 25W and side walls 25S, and the web 25W terminates a substantial distance below the level of the valve rod 24. The

side walls 25S, however, extend upwardly to a point on opposite sides of the top bar 22B and a supporting pivot 25P extends through the upper ends of the walls 25S and the body of the gun so as to constitute an upper pivot for the trigger 25.

The U-shaped member 48 is located in the space between the two side walls 25 of the trigger and a connecting rod 50 extends between the side walls 25S and is embraced by the U-shaped member 25. Thus, when the trigger 25 is pulled rearwardly, the valve stem 24 will be actuated in a valve-opening direction.

The valve stem 24, is however, urged toward a closed position by a spring plunger assembly 52 that is mounted in the handle 22H in alignment with the valve rod 24. Thus the handle 22H has a threaded bore 53 formed therethrough, and in this threaded bore a forward member 54 is mounted by threading the same rearwardly into the bore 53, and a rear member 55 is threaded into the rear end of the threaded bore 53. The forward member 54 serves several functions, and among these functions is the slidable support of a return plunger 56 that may engage the rear or right hand side of the U-shaped member 48 to urge the valve rod 24 toward closed position. The plunger 56 is urged to the left, or in a valve-closing direction by an expansive coil spring 57 located within the bore 53, and acting between the member 55 and the plunger 56 to urge the same in its valve-closing direction.

The rear member 55 is in the form of a sleeve with a cross wall 55W at its outer or right end, as viewed in FIG. 7, and within the sleeve-like member 55 a headed stem 58 is provided which has its head abutted with the cross wall 55W and has its stem extended partially through the expansive coil spring 57, thus to support the spring 57 in its right hand position. The stem 58 also engages the plunger 56 to limit inward adjustment of the member 55, and this avoids interference of the member 55 with the safety functioning of the member 54 that will be described. The left hand portion of the spring 57 is externally supported by extending into an enlarged axial bore 54B formed in the member 54, and at its left hand end and with the bore 54B the spring engages the plunger 56 to urge the same in a left hand direction. The wall 55W has a wrench socket 55S formed therein so that the member 55 may be used as a spring adjusting means.

The member 54, as another one of its functions, acts in cooperation with a tiltable latching member 60 for holding the rod 24 in its valve-opening position against the action of the spring 57. The latch member 60 in its accomplishment of this function follows the disclosure of Patent No. 2,956,752, patented October 18, 1960. Thus the latch 60 is formed as a sheet metal stamping having a pair of ears 60E extended upwardly from its opposite sides and pivoted on the cross rod 50 so that the latch 60 is carried by the trigger 25 and may be rocked about the axis of the cross rod 50.

At its forward or left hand end, as viewed in FIG. 7, the latch 60 has a downturned end 60A that serves as a finger piece that may be engaged by the user to rock the latch member 60 in a counterclockwise direction as viewed in FIG. 7, and this is done when the trigger 25 has been actuated in a rear direction to a position such as the dotted line position shown in FIG. 1. At this time, the rear or right hand end of the trigger 25 may be raised to put an upturned latching end 60L thereof in position against a rear or right hand surface 62 of the member 54. With the latching member thus moved into its effective position, the trigger 25 may be released slightly to engage the latching end 60L firmly with the surface 62 so that the trigger 25 will be held in its actuated position until it is again moved to the right without putting lifting pressure on the finger piece 60A. The latch is so weighted that under such circumstances it will disengage.

As above pointed out, the member 54 serves several functions and an additional function is that of a settable means for blocking the trigger 25 so that the trigger 25

is disabled and the valve rod **24** cannot be unseated by operation of the trigger **25**. As will be evident in FIGS. 1 and 6 to 9, the member **54** is generally in the form of a screw machine part providing the reduced sleeve-like portion that is threaded into the bore **53** and having an enlarged head portion **154** at its left hand end. It is on this enlarged head-like portion **154** that the latching surface **62** is formed. The head portion **154** is of a width somewhat greater than the space between the side walls **25S** of the trigger **25**, and on opposite sides of the head **154**, flat surfaces **154S** are spaced apart in a distance somewhat less than the distance between the side walls **25S** of the trigger. In one rotative position, as shown in FIGS. 1 and 8, the trigger **25** may be actuated in a rearward direction to move the side walls **25S** thereof past and into position opposite the flat surfaces **154S**. This is the normal operation of the trigger **25**. However, when it is desired to disable the trigger **25**, the member **54** may be rotated through 90° to the position shown in FIG. 9, and in this position, the forward surfaces of the head **154** are disposed in the path of the side walls **25S** of the trigger. Hence the trigger **25** cannot be actuated, or in other words, the trigger mechanism is disabled.

The member **54** thus constitutes a control element which when rotated through 90° about its axis may be set either in its ineffective position of FIG. 8, or in its effective position or disabling position of FIGS. 6 and 9, and means are associated with the member **54** for actuating the member **54** between these two positions and for limiting the rotative movement of the member **54**. Such means as herein shown constitute a knurled operating disc **65** that surrounds the sleeve portion of the element **54** and which is guided and positioned by an annular ridge **54R** on the member **54**. The operating disc **65** is held in a set position on the member **54** by means of a set screw **66**, and when this set screw **66** is released, the member **54** may be rotated to adjust its longitudinal position, and thereby assure proper cooperation with the trigger **25** when the trigger **25** is to be disabled. After the member **54** has been set in its desired longitudinal position, the set screw **66** is tightened to fix the operating disc **65** in a predetermined rotative relationship on the member **54** so that the operating disc **65** may cooperate with the top bar **22B** in limiting the rotating movement of the member **54** to the desired range. Thus, as will be evident in FIGS. 1, 8 and 9, the disc **65** is cut away to provide two circumferentially spaced shoulders **65A** and **65B**, and when the member **54** is rotated to its ineffective position of FIG. 8, the shoulder **65A** engages the left hand side of the top bar **22B** so that the head **154** is accurately located in its ineffective position. When the trigger **25** is to be disabled, the operating disc **65** is engaged to rotate the member **54** in a counterclockwise direction from the position of FIG. 8 to the position of FIG. 9, and this second position is determined by engagement of the shoulder **65B** of the disc with the right hand side of the top bar **22B** as shown in FIG. 9.

Under the present invention, means are also provided for preventing accidental actuation of the trigger **25**, as for example when the gun **22** is dropped, or when some object strikes the trigger. For this purpose an elongated sheet metal stamping is formed to provide a trigger guard **66** that extends from the lower end of the handle **22H** to the mounting ring **22R** in the relationship shown in FIG. 1.

At its lower rear end, the trigger guard **66** is associated with the lower end of the handle in the manner shown in FIGS. 11 and 12. Thus, the handle **22H** is hollow and open at its lower end, and the lower rear end of the trigger guard **66** is bent upwardly so that the main portion of the trigger guard may extend beneath the lower end of the handle while a bent end **66A** extends upwardly into the handle. At the upper end of the portion **66A**, a pair of oppositely extending ears **66E** are provided, and these ears are arranged to extend laterally in a tightly fitted relation into slots **67** that are formed in the opposite sides of the handle **22H**. This assembly operation is performed by inserting the part **66** into the lower end of the handle at an angle and then rotating the member **66** to the relationship shown in FIG. 21. Near its lower end an electrical ground screw **68** is also provided in the trigger guard **66**. At its upper end the trigger guard **66** is formed with a narrow key-like projection **69** as shown in FIGS. 7 and 10, and this projection **69** is adapted to extend into the lower key slot **32** of the mounting ring **22R**, and at its rear end the lower key slot **32** is recessed forwardly as will be evident in FIGS. 7 and 10 so that after the projecting portion **70** has been put in place, the nut **35** may be put in place and clamped against the adjacent surface of the trigger guard **66** to hold the upper forward end thereof in its assembled relationship.

As hereinabove pointed out, the invention has also been illustrated in FIG. 13 as embodied in an automatically controlled airless spray gun **120**. The spray gun **120** has a body **122** that in some respects is like the body **22** in that a top bar **122B** is provided having a downwardly projecting mounting ring **122R** at its forward end and a downwardly projecting mounting portion **122H** at its rear end, thus to provide a clearance space **122C** between the mounting ring **122R** and the mounting bore **153** in the downwardly projecting mounting portion **122H**. The mounting ring **122R** has a barrel **121** associated therewith in substantially the same manner as described in connection with FIG. 1, and this barrel has a spray tip **123**, a valve seat member **140** and a valve rod **124** associated therewith in the manner hereinabove described.

The spray gun **120** is adapted to be mounted in a stationary working position by means including a transverse mounting bore **180** and a fastening or clamping screw **181**, and when mounted in this position, the valve rod is controlled by piston and cylinder means **185** that are associated with the valve rod **124**. Thus, the bore **153** has a piston rod **185R** slidable therein, and at its forward end or left hand end, as viewed in FIG. 13, the rod **185R** is detachably connected with the valve rod **124** by means including a threaded fastening cap **187**. The piston rod **185R** extends to the right out of the bore **153**, and has a piston structure **185P** fixed thereon, this piston being located within a cylinder **185C** that is threaded at **188** into an enlarged counterbore **153C**.

The cylinder **185** has an integral hood-like extension providing a spring mounting space **190**, and an expansive coil spring **191** located within the mounting space **190** acts against an end wall **192** and against the piston **185P** to urge the piston to the left so as to thereby close the valve provided by the valve rod **124** and the valve seat **140**.

The mounting portion **122H** has an inlet passage **193** formed therein whereby pressure fluid such as pressure air or hydraulic liquid may be admitted to the cylinder **185** to the left of the piston **185P**, and thus fluid pressure may be utilized to open the paint valve against the normal closing force of the spring **191**.

Under this invention, safety provisions are made which include formation of the valve seat member **140** as hereinbefore described, and as illustrated in FIGS. 4 and 5 of the drawings, and such safety provisions also include means whereby the valve-opening means may be disabled. Thus, as shown in FIG. 13, the piston rod **185R** has an extension **285R** projecting beyond the piston to the right within the space occupied by the spring **191** and an abutment screw **195** is threaded axially through the wall **192**. The abutment screw **195** has an operating handle or disc **196** thereon whereby the abutment screw may be adjusted to the left as viewed in FIG. 13 to the dotted line position wherein the left hand end of the abutment screw **195** engages the right hand end of the piston rod **185R**, thus to prevent right hand actuation of the piston. The abutment screw **195** in the present in-

stance has an axial bore 195B formed therein to provide for pressure relief during actuation of the piston.

From the foregoing description it will be apparent that the present invention provides airless paint spray guns wherein safety means tend to prevent accidental injury to the user. It will be evident that the safety means provided under this invention are relatively simple and are effective in different ways to counteract different situations where accidental discharge of paint is possible.

Thus while preferred embodiments of the invention are illustrated herein, it is to be understood that changes and variations may be made by those skilled in the art without departing from the spirit and scope of the appended claims.

We claim:

1. In an airless spray gun adapted for spraying liquid at extremely high pressures, a gun body comprising a top bar having downwardly projecting front and rear mounting portions at the front and rear ends of the bar with a substantial clearance space beneath the top bar between said downwardly projecting mounting portions, said downwardly projecting mounting portions having aligned mounting openings therethrough, a spray head comprising a sleeve mounted in and projecting forwardly from said forward mounting portion and having a side inlet for liquid, a spray tip removably mounted on the forward end of said sleeve and having a spray orifice, a valve seat member having an axial valve passage and forward and rear ends mounted in said forward end of the sleeve in a position such that said forward end of the seat member is exposed when said tip is removed, a valve rod axially slidable in said sleeve to move the forward end of the valve rod toward and away from the rear end of the valve seat member, said valve rod extending rearwardly from said sleeve to locate the rear end of the rod in said clearance space, packing gland means in the rear end of said sleeve to provide a sliding seal for the rod, valve closing means including a plunger operatively connected to the rear end of the valve rod in aligned relation and a plunger guide and a plunger return spring acting on the plunger and mounted in the opening in said rear mounting portion, and a transverse slot formed in the outer end of said valve seat member for laterally spreading and dispersing liquid that may be inadvertently discharged from the valve passage when the spray tip has been removed.

2. In an airless spray gun adapted for spraying liquid at extremely high pressures, a gun body comprising a top bar having downwardly projecting front and rear mounting portions at the front and rear ends of the bar with a substantial clearance space beneath the top bar between said downwardly projecting mounting portions, said downwardly projecting mounting portions having aligned mounting openings therethrough, a spray head comprising a sleeve mounted in and projecting forwardly from said forward mounting portion and having a side inlet for liquid, a spray tip removably mounted on the forward end of said sleeve and having a spray orifice, a valve seat member having an axial valve passage and forward and rear ends mounted in said forward end of the sleeve in a position such that said forward end of the seat member is exposed when said tip is removed, a valve rod axially slidable in said sleeve to move the forward end of the valve rod toward and away from the rear end of the valve seat member, said valve rod extending rearwardly from said sleeve to locate the rear end of the rod in said clearance space, packing gland means in the rear end of said sleeve to provide a sliding seal for the rod, valve closing means including a plunger operatively connected to the rear end of the valve rod in aligned relation and a plunger guide and a plunger return spring acting on the plunger and mounted in the opening in said rear mounting portion, valve opening means mounted on said body and connected to said plunger, manually settable disabling means for preventing valve opening actuation of said valve opening means, and a transverse slot formed in the outer end of said valve seat member for laterally spreading and dispersing liquid that may be inadvertently discharged from the valve passage when the spray tip has been removed.

3. In an airless spray gun of the kind that operates at extremely high pressure, a gun body having a forwardly projecting tubular barrel at the forward end and a downwardly projecting handle at the other end with a clearance space between the barrel and the handle, a spray tip removably secured on forward end of the barrel, an annular valve seat member fixed axially in position in said forward end of the barrel closely adjacent to said spray tip and in position to have forward end of the valve seat member exposed when the spray tip is removed, a valve rod mounted reciprocably in said barrel for cooperative engagement with said valve seat member at the rear end of such member, valve closing means including a plunger and a spring mounted in said handle in alignment with the valve rod and with the valve rod connected to the plunger in said clearance space, a trigger pivoted on said body and connected to said plunger for actuating said valve rod in a valve-opening direction, means mounted on the body rearwardly of the trigger and settable in a safety position wherein movement of the trigger in said valve-opening direction is blocked, a trigger guard extending downwardly from said handle in spaced relation to the trigger and then rearwardly beneath the lower end of the trigger and anchored on the lower end of the handle, and a transverse slot formed in said one end of said valve seat member to produce a spreading action on liquid that passes through the valve seat member while said spray tip is removed.

4. In an airless spray gun of the kind that operates at extremely high pressure, a gun body having a forwardly projecting tubular barrel at the forward end and a downwardly projecting handle at the other end with a clearance space between the barrel and the handle, a spray tip removably secured on forward end of the barrel, an annular valve seat member fixed axially in position in said forward end of the barrel closely adjacent to said spray tip and in position to have forward end of the valve seat member exposed when the spray tip is removed, a valve rod mounted reciprocably in said barrel for cooperative engagement with said valve seat member at the rear end of such member, valve closing means including a plunger and a spring mounted in said handle in alignment with the valve rod and with the valve rod connected to the plunger in said clearance space, a trigger pivoted on said body and connected to said plunger for actuating said valve rod in a valve-opening direction, means mounted on the body rearwardly of the trigger and settable in a safety position wherein movement of the trigger in said valve-opening direction is blocked, and a trigger guard extending downwardly from said handle in spaced relation to the trigger and then rearwardly beneath the lower end of the trigger and anchored on the lower end of the handle.

5. In an airless spray gun of the kind that operates at extremely high pressure, a gun body having a forwardly projecting tubular barrel at the forward end and a downwardly projecting handle at the other end with a clearance space between the barrel and the handle, a spray tip removably secured on forward end of the barrel, an annular valve seat member fixed axially in position in said forward end of the barrel closely adjacent to said spray tip and in position to have forward end of the valve seat member exposed when the spray tip is removed, a valve rod mounted reciprocably in said barrel for cooperative engagement with said valve seat member at the rear end of such member, valve closing means including a plunger and a spring mounted in said handle in alignment with the valve rod and with the valve rod connected to the plunger in said clearance space, a trigger pivoted on said body and connected to said plunger for actuating said valve rod in a valve-opening direction, means mounted on the body

rearwardly of the trigger and settable in a safety position wherein movement of the trigger in said valve-opening direction is blocked, and transverse slot means formed in said one end of said valve seat member to produce a spreading action on liquid that passes through the valve seat member while said spray tip is removed.

6. In an airless spray gun of the kind that operates at extremely high pressure, a gun body having a tubular barrel at one end and a handle at the other end, a spray tip removably secured on the end of the barrel remote from the handle, an annular valve seat member fixed axially in position in said end of the barrel closely adjacent to said spray tip and in position to have one end of the valve seat member exposed when the spray tip is removed, a valve rod reciprocable in said barrel for cooperative engagement with said valve seat member at the other end of such member, spring means urging the valve rod to its closed position, means including a trigger pivoted on said body for actuating said needle valve in a valve-opening direction, means on the body settable in a safety position wherein movement of the trigger in said valve-opening direction is blocked, and transverse slot means formed in said one end of said valve seat member to produce a spreading action on liquid that passes through the valve seat member while said spray tip is removed.

7. In an airless spray gun of the kind that operates at extremely high pressure, a gun body having a forwardly projecting tubular barrel at the forward end and a handle at the other end with a clearance space between the barrel and the handle, a spray tip removably secured on forward end of the barrel, an annular valve seat member fixed axially in position in said forward end of the barrel closely adjacent to said spray tip and in position to have forward end of the valve seat member exposed when the spray tip is removed, a valve rod mounted reciprocably in said barrel for cooperative engagement with said valve seat member at the rear end of such member, valve closing means including a plunger and a spring mounted in said handle in alignment with the valve rod and with the valve rod connected to the plunger in said clearance space, a trigger pivoted on said body and connected to said plunger for actuating said valve rod in a valve-opening direction, means mounted on the body and surrounding said plunger and rotatively settable in a safety position wherein movement of the trigger in said valve-opening direction is blocked, and transverse slot means formed in said one end of said valve seat member to produce a spreading action on liquid that passes through the valve seat member while said spray tip is removed.

8. In an airless spray gun of the kind that operates at extremely high pressure, a gun body having a forwardly projecting tubular barrel at the forward end and a handle at the other end with a clearance space between the barrel and the handle, a spray tip removably secured on forward end of the barrel, an annular valve seat member fixed axially in position in said forward end of the barrel closely adjacent to said spray tip and in position to have forward end of the valve seat member exposed when the spray tip is removed, a valve rod mounted reciprocably in said barrel for cooperative engagement with said valve seat member at the rear end of such member, valve closing means including a plunger and a spring mounted in said handle in alignment with the valve rod and with the valve rod connected to the plunger in said clearance space, a trigger pivoted on said body and connected to said plunger for actuating said valve rod in a valve-opening direction, and means mounted on the body and surrounding said plunger and rotatively settable in a safety position wherein movement of the trigger in said valve-opening direction is blocked.

9. In an airless spray gun of the kind that operates at extremely high pressure, a gun body having a forwardly projecting tubular barrel at the forward end and a handle at the other end with a clearance space between the barrel and the handle, a spray tip removably secured on forward end of the barrel, an annular valve seat member fixed axially in position in said forward end of the barrel closely adjacent to said spray tip and in position to have forward end of the valve seat member exposed when the spray tip is removed, a valve rod mounted reciprocably in said barrel for cooperative engagement with said valve seat member at the rear end of such member, valve closing means including a plunger and a spring mounted in said handle in alignment with the valve rod and with the valve rod connected to the plunger in said clearance space, a trigger pivoted on said body and connected to said plunger for actuating said valve rod in a valve-opening direction, and transverse slot means formed in said one end of said valve seat member to produce a spreading action on liquid that passes through the valve seat member while said spray tip is removed.

10. In an airless spray gun of the kind that operates at extremely high pressure, a gun body having a forwardly projecting tubular barrel at the forward end and a handle at the other end with a clearance space between the barrel and the handle, a spray tip removably secured on forward end of the barrel, an annular valve seat member fixed axially in position in said forward end of the barrel closely adjacent to said spray tip and in position to have forward end of the valve seat member exposed when the spray tip is removed, a valve rod mounted reciprocably in said barrel for cooperative engagement with said valve seat member at the rear end of such member, valve closing means including a plunger and a spring mounted in said handle in alignment with the valve rod and with the valve rod connected to the plunger in said clearance space, a trigger pivoted on said body and connected to said plunger for actuating said valve rod in a valve-opening direction, a control element surrounding said plunger and threaded into said handle for adjustment longitudially of the axis of said plunger, a holding member carried on said trigger and engageable with said control element for holding said valve rod in an open position, means on said control element effective in one rotative position of the control element to block movement of said trigger in a valve-opening direction, and transverse slot means formed in said one end of said valve seat member to produce a spreading action on liquid that passes through the valve seat member while said spray tip is removed.

11. In an airless spray gun of the kind that operates at extremely high pressure, a gun body having a forwardly projecting tubular barrel at the forward end and a handle at the other end with a clearance space between the barrel and the handle, a spray tip removably secured on forward end of the barrel, an annular valve seat member fixedly axially in position in said forward end of the barrel closely adjacent to said spray tip and in position to have forward end of the valve seat member exposed when the spray tip is removed, a valve rod mounted reciprocably in said barrel for cooperative engagement with said valve seat member at the rear end of such member, valve closing means including a plunger and a spring mounted in said handle in alignment with the valve rod and with the valve rod connected to the plunger in said clearance space, a trigger pivoted on said body and connected to said plunger for actuating said valve rod in a valve-opening direction, a control element surrounding said plunger and threaded into said handle for adjustment longitudinally of the axis of said plunger, a holding member carried on said trigger and engageable with said control element for holding said valve rod in an open position, and means on said control element effective in one rotative position of the control element to block movement of said trigger in a valve-opening direction.

12. In an airless spray gun of the kind that operates at extremely high pressure, a gun body having a forwardly projecting tubular barrel at the forward end and a handle at the other end with a clearance space between the barrel and the handle, a spray tip removably secured on forward end of the barrel, an annular valve seat member

fixed axially in position in said forward end of the barrel closely adjacent to said spray tip and in position to have forward end of the valve seat member exposed when the spray tip is removed, a valve rod mounted reciprocably in said barrel for cooperative engagement with said valve seat member at the rear end of such member, valve closing means including a plunger and a spring mounted in said handle in alignment with the valve rod and with the valve rod connected to the plunger in said clearance space, a trigger pivoted on said body and connected to said plunger for actuating said valve rod in a valve-opening direction, a control element surrounding said plunger and threaded into said handle for adjustment longitudinally of the axis of said plunger, a holding member carried on said trigger and engageable with said control element for holding said valve rod in an open position, and transverse slot means formed in said one end of said valve seat member to produce a spreading action on liquid that passes through the valve seat member while said spray tip is removed.

13. In an airless spray gun of the kind that operates at extremely high pressure, a gun body having a forwardly projecting tubular barrel at the forward end and a handle at the other end with a clearance space between the barrel and the handle, a spray tip removably secured on forward end of the barrel, an annular valve seat member fixed axially in position in said forward end of the barrel closely adjacent to said spray tip and in position to have forward end of the valve seat member exposed when the spray tip is removed, a valve rod mounted reciprocably in said barrel for cooperative engagement with said valve seat member at the rear end of such member, valve closing means including a plunger and a spring mounted in said handle in alignment with the valve rod and with the valve rod connected to the plunger in said clearance space, a trigger pivoted on said body and connected to said plunger for actuating said valve rod in a valve-opening direction, a control element surrounding said plunger and threaded into said handle for adjustment longitudinally of the axis of said plunger, a holding member carried on said trigger and engageable with said control element for holding said valve rod in an open position, a stop member on said control element for engaging said handle to limit rotation of the control element between first and second rotative positions, means for releasing the stop member from the control element when the control element is to be adjusted, means on said control element effective in said first rotative position on the control element to block movement of said trigger in a valve-opening direction and ineffective in said second rotative position, and transverse slot means formed in said one end of said valve seat member to produce a spreading action on liquid that passes through the valve seat member while said spray tip is removed.

14. In an airless spray gun adapted for spraying liquid at extremely high pressures, a gun body comprising a top bar having downwardly projecting front and rear mounting portions at the front and rear ends of the bar with a substantial clearance space beneath the top bar between said downwardly projecting mounting portions, said downwardly projecting mounting portions having aligned mounting openings therethrough, a spray head comprising a sleeve mounted in and projecting forwardly from said forward mounting portion and having a side inlet for liquid, a spray tip removably mounted on the forward end of said sleeve and having a spray orifice, a valve seat member having an axial valve passage and forward and rear ends mounted in said forward end of the sleeve in a position such that said forward end of the seat member is exposed when said tip is removed, a valve rod axially

slidable in said sleeve to move the forward end of the valve rod toward and away from the rear end of the valve seat member, said valve rod extending rearwardly from said sleeve to locate the rear end of the rod in said clearance space, packing gland means in the rear end of said sleeve to provide a sliding seal for the rod, valve closing means including a plunger operatively connected to the rear end of the valve rod in aligned relation and a plunger guide and a plunger return spring acting on the plunger and mounted in the opening in said rear mounting portion, piston and cylinder means mounted on said body and connected to said plunger for imparting opening movement to the valve rod, manually settable means for disabling said valve opening means, and a transverse slot formed in the outer end of said valve seat for laterally spreading and dispersing liquid that may be inadvertently discharged from the valve passage when the spray tip has been removed.

15. In an airless spray gun adapted for spraying liquid at extremely high pressures, a gun body comprising a top bar having downwardly projecting front and rear mounting portions at the front and rear ends of the bar with a substantial clearance space beneath the top bar between said downwardly projecting mounting portions, said downwardly projecting mounting portions having aligned mounting openings therethrough, a spray head comprising a sleeve mounted in and projecting forwardly from said forward mounting portion and having a side inlet for liquid, a spray tip removably mounted on the forward end of said sleeve and having a spray orifice, a valve seat member having an axial valve passage and forward and rear ends mounted in said forward end of the sleeve in a position such that said forward end of the seat member is exposed when said tip is removed, a valve rod axially slidable in said sleeve to move the forward end of the valve rod toward and away from the rear end of the valve seat member, said valve rod extending rearwardly from said sleeve to locate the rear end of the rod in said clearance space, packing gland means in the rear end of said sleeve to provide a sliding seal for the rod, valve closing means including a plunger operatively connected to the rear end of the valve rod in aligned relation and a plunger guide and a plunger return spring acting on the plunger and mounted in the opening in said rear mounting portion, piston and cylinder means mounted on said body and connected to said plunger for imparting opening movement to the valve rod, and a transverse slot formed in the outer end of said valve seat for laterally spreading and dispersing liquid that may be inadvertently discharged from the valve passage when the spray tip has been removed.

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