June 2, 1970 J. WAGNER 3,515,355

AIRLESS SPRAY GUN

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FIG 1

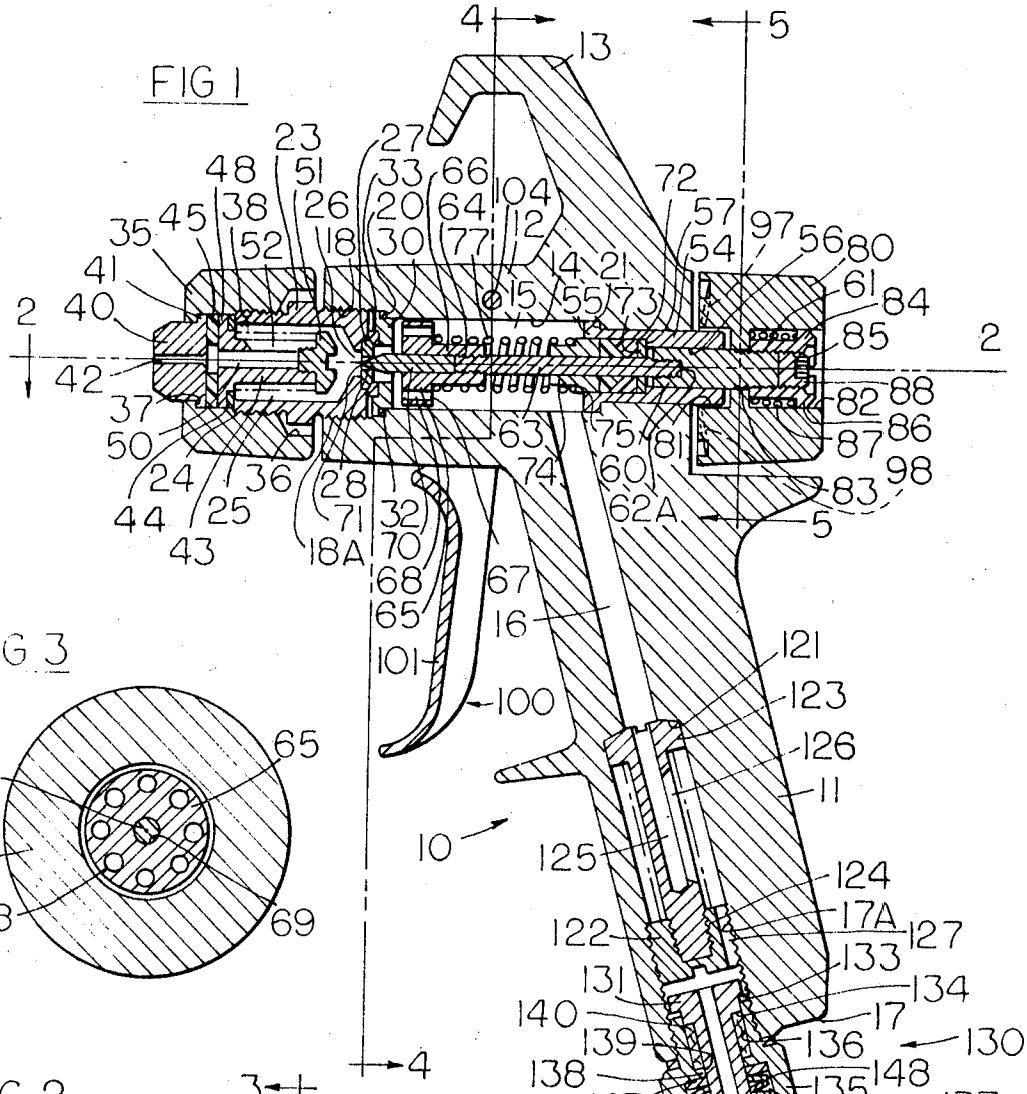


FIG 3




FIG 2

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AIRLESS SPRAY GUN

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FIG 4

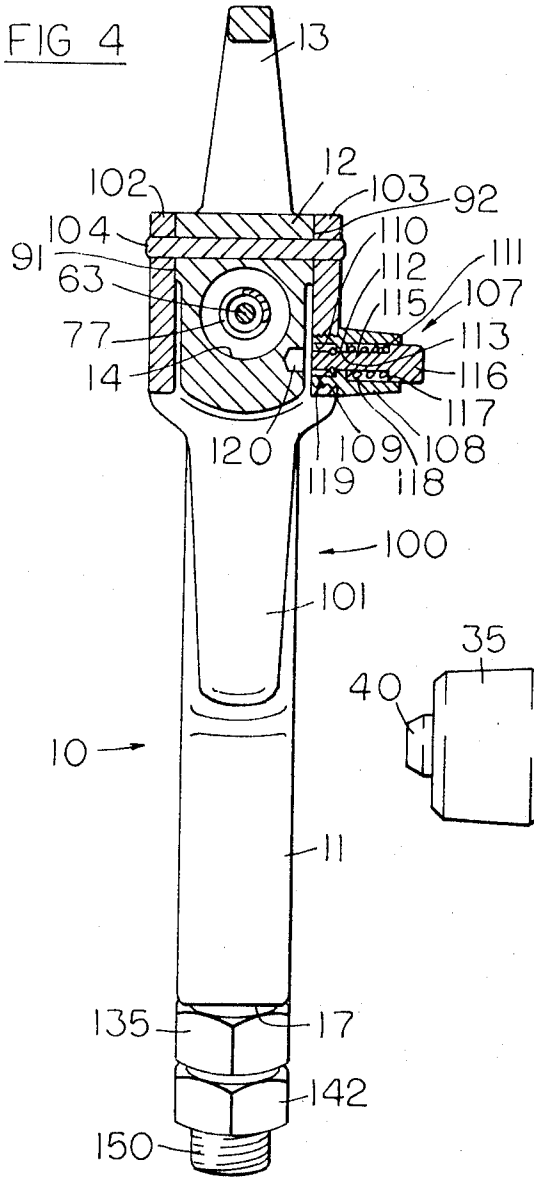



FIG 5

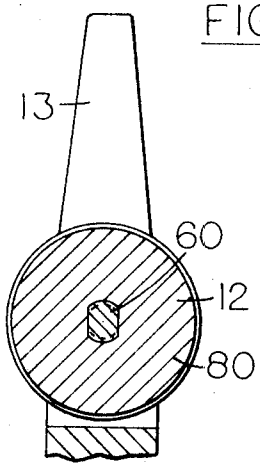



FIG 7

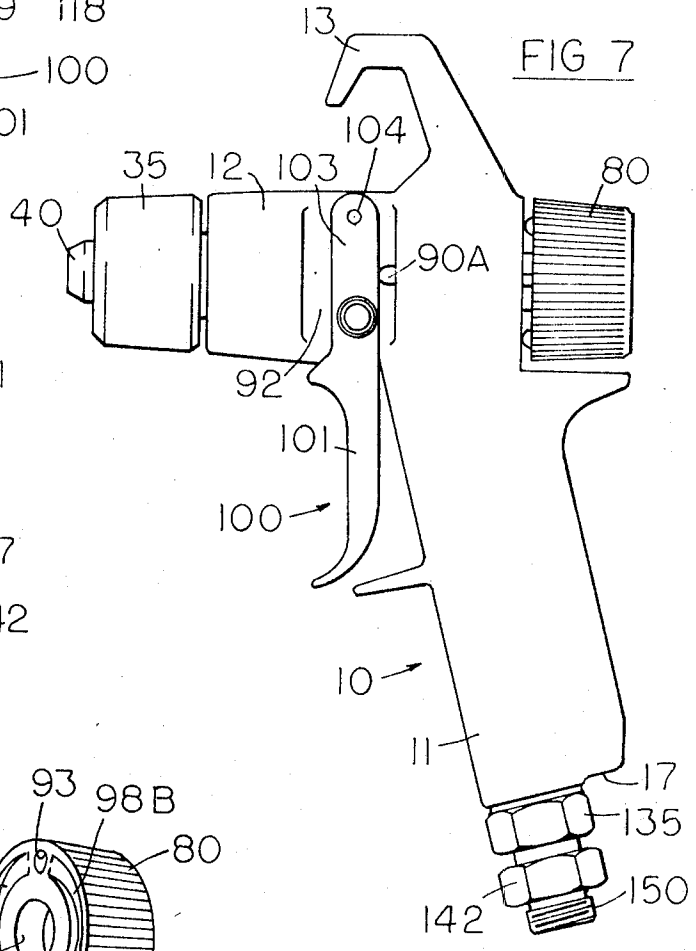
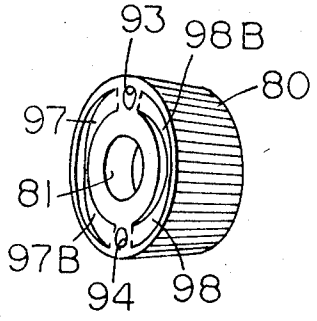



FIG 6

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AIRLESS SPRAY GUN

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FIG 8

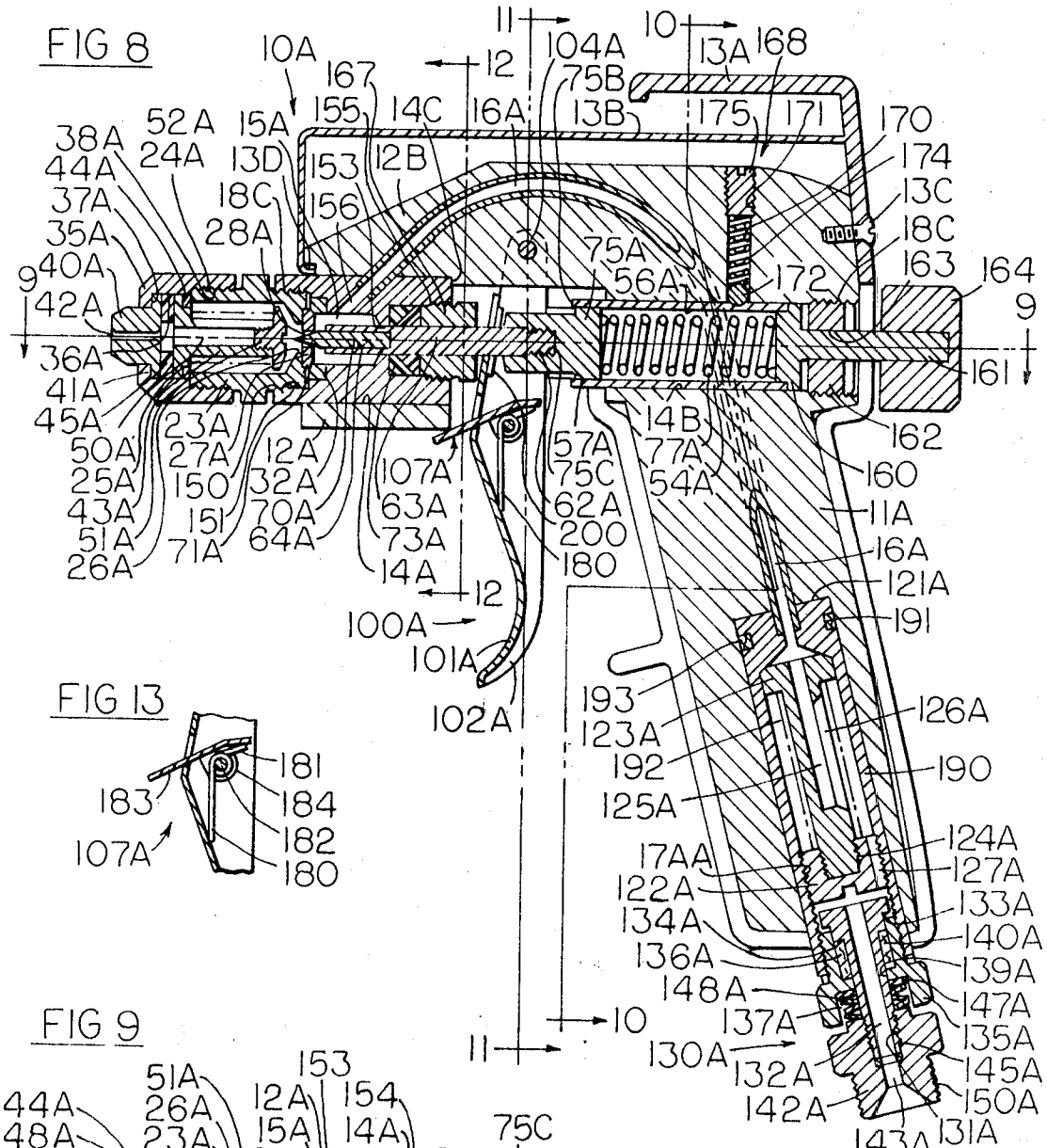
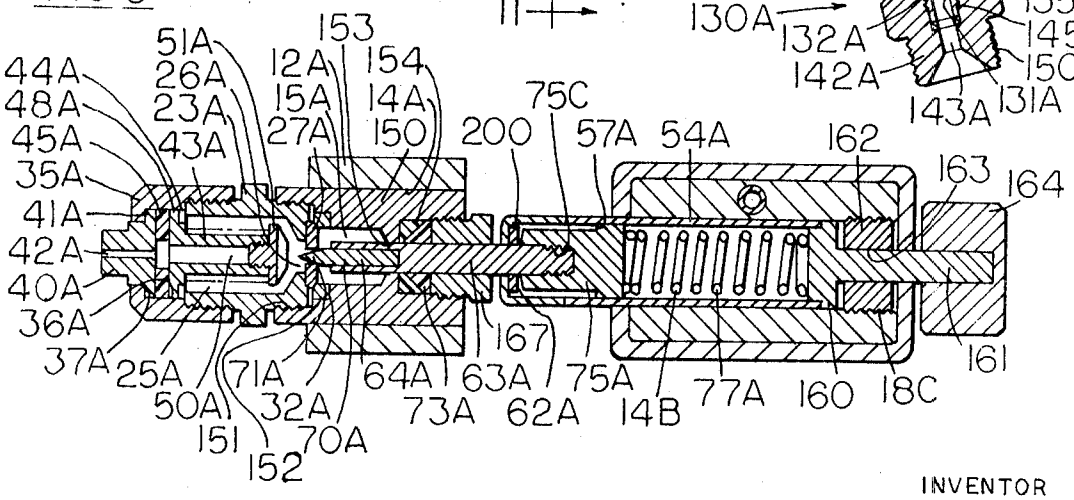



FIG 13




FIG 9

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AIRLESS SPRAY GUN

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FIG 10

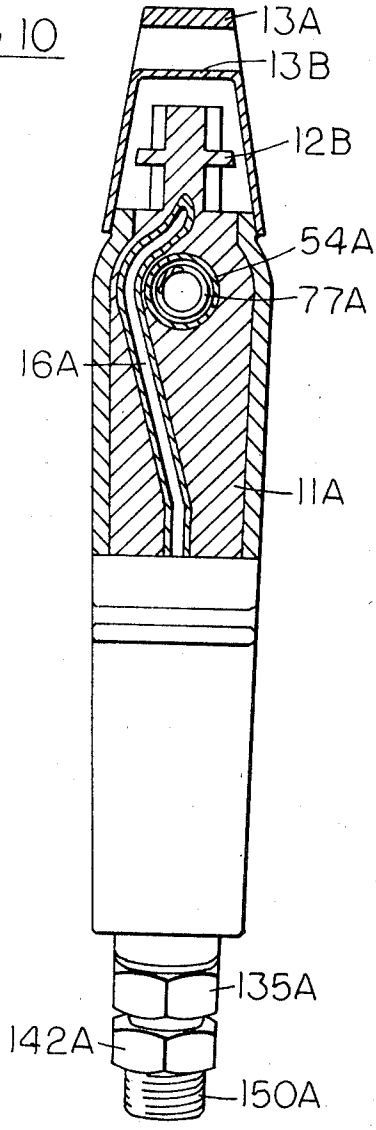



FIG 11

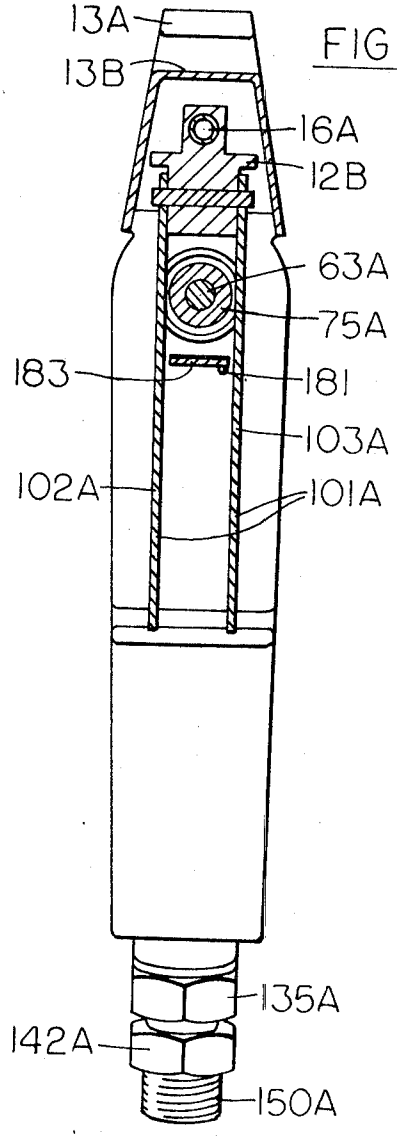
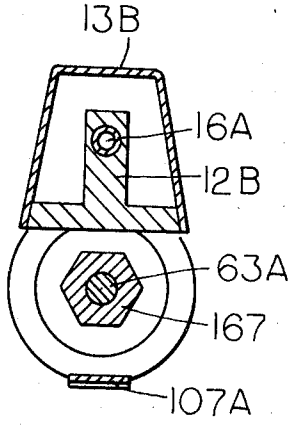



FIG 12

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United States Patent Office 3,515,355 Patented June 2, 1970



3,515,355

# AIRLESS SPRAY GUN

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Int. Cl. B05b 7/02
U.S. Cl. 239—526 4 Claims

## ABSTRACT OF THE DISCLOSURE

This invention relates to spray guns and more particularly to the type of spray gun wherein air pressure is forced into the top of a tank containing a liquid, such as paint, whereby the liquid is forced out of the tank into a conduit leading to a fitting in the housing of a spray gun provided with a control valve for the distribution of the fluid. The air does not mix with the fluid.

This invention relates to spray guns which operate on hydraulic pressure, exclusively, so that air does not mix with the fluid passing through the spray gun.

An object of the present invention is to provide a superior type of control for a valve in a spray gun accommodating 3000 pounds per square inch fluid pressure.

Another object of the present invention is to provide a trigger lock to hold the control valve in open position for continuous spraying.

Still another object of the present invention is to provide a safety lock to facilitate cleaning the spray gun.

Still another object of the present invention is to provide a self-adjusting control valve.

A further object of the present invention is to provide a construction with an arrangement of parts to facilitate the assembling and disassembling of the parts for easy cleaning.

Other objects of the present invention will be pointed out in part and become apparent in part in the following specification and claims.

Referring to the drawings in which similar characters of reference indicate corresponding parts in all the figures:

FIG. 1 is a vertical medial cross-sectional view through the new and improved airless spray gun.

FIG. 2 is a horizontal, medial, cross-sectional view, taken along line 2—2 of FIG. 1; enlarged for clarity.

FIG. 3 is a vertical cross-sectional view, taken along line 3—3 of FIG. 2.

FIG. 4 is a view, partly in cross-section, taken along line 4—4 of FIG. 1; looking in the direction of the arrows.

FIG. 5 is a view, partly in cross-section, taken along line 5—5 of FIG. 1, looking in the direction of the arrows.

FIG. 6 is a perspective view of the safety lock showing the cam surfaces.

FIG. 7 is a side elevational view of the construction illustrated in FIG. 1.

FIG. 8 is a vertical, medial, cross-sectional view through a modified construction of the airless spray gun illustrated in FIG. 1.

FIG. 9 is a horizontal, medial, cross-sectional view, taken along line 9—9 of FIG. 8.

FIG. 10 is a view, partly in cross-section, taken along line 10—10 of FIG. 8, looking in the direction of the arrows.

FIG. 11 is a view, partly in cross-section, taken along line 11—11 of FIG. 8, looking in the direction of the arrows.

FIG. 12 is a view, partly in cross-section, taken along line 12—12 of FIG. 8, looking, in the direction of the arrows.



FIG. 13 is a fragmentary view of the trigger lock mechanism.

Attention is directed to FIGS. 1 thru 7 wherein is illustrated the new and improved airless spray gun, generally indicated by reference numeral 10, and comprising a housing having the shape of a fire arm pistol.

The housing comprises, a handle 11 integrally attached to a barrel 12, located at generally a right angle to the handle 11, and a hook 13 preferably formed integral with barrel 12.

Barrel 12 is provided with an axial bore 14. Axial bore 14 is stepped so as to provide threads 18, a chamber 15, a shoulder 20 and a circular abutment 21. Handle 11 is provided with an inlet passageway 16 which connects chamber 15 with an opening having a threaded portion 17A in the base of the handle 11.

A filter casing 23 is externally provided with a first set of threads 18A and a second set of threads 24. Threads 18A rotatively engage threads 18. Axially casing 23 is provided with a cavity 25 having an inlet orifice 26. A disk 27 provided with a valve seat 28 abuts filter casing 23 at inlet orifice 26 with the valve seat 28 aligned with inlet orifice 26.

A washer 30 having an axial passageway 31 is slidably mounted in axial bore 14 with a fluid packing ring 32 interposed between shoulder 20 and washer 30. In like manner a packing washer 33 is interposed between disk 27 and washer 30. The end of filter casing 23 engaging washer 30, washer 33 and disk 27, forces fluid packing ring 32, packing washer 33 and disk 27 into fluid tight position through threads 18 and 18A.

A front cap 35 having a stepped bore 36 is provided with a circular abutment 37 and a threaded area 38 in said bore 36. Threaded area 38 rotatively engages the second set of threads 24.

A spray tip 40 provided externally with a shoulder 41 and internally with an outlet port 42 is located in bore 36 with shoulder 41 engaging circular abutment 37.

A filter cartridge 43 may be located in cavity 25 with a sealing washer 44 and a second sealing washer 45 located on opposite sides of a circular ridge 48 on cartridge 43. In this manner, rotation of front cap 35 upon second set of threads 24 forces the inside wall 46 of spray tip 40 against second sealing washer 45 which abuts circular ridge 48 forcing sealing washer 44 against the end of filter casing 23 in fluid tight relationship. Fluid flowing past valve seat 28 flows into cavity 25 and through filter cartridge 43 into outlet port extension 50 and outlet port 42 aligned therewith and through an orifice in second sealing washer 45 provided for that purpose.

Filter cartridge 43 is shown with a screw 51 which blocks one end of outlet extension 50, and an opening 52. The filter material, is not shown for purposes of clarity in the drawing but it is indicated by a dot and dash line. The filter material can be of any commercial type such as wire mesh.

A sleeve 54 provided with a collar 55 and a passageway 56 having a circular rim 57 is located in chamber 15 with collar 55 engaging circular abutment 21.

A stud 60 provided with external threads 61 and internal threads 62 is slidably mounted in passageway 56. An adjusting pin 63 is provided with threaded ends 62A and 64. Threads 62A rotatively engage threads 62 to fasten pin 63 to stud 60. A flanged member 65 having a neck 66 forming a spring seat 67 is provided with a plurality of openings 68, an axial passageway 69 and a threaded area 64A in passageway 69. Threaded area 64A rotatively engages threaded end 64 to adjustably locate flanged member 65 upon adjusting pin 63. Flanged member 65 is slidably mounted in axial bore 14. A needle valve 70 having a valve plug 71 is fastened in axial pas-

sageway 69 by means of a press fit so that valve plug 71 may engage and disengage valve seat 28. A packing ring 72 and a washer 73 are slidably mounted upon pin 63 with packing ring 72 abutting circular rim 57. A collar 74 provided with a spring seat 75 is also slidably mounted upon pin 63. A coil spring 77 is interposed between spring seat 67 and spring seat 75 so as to urge valve plug 71 into engagement with valve seat 28 to thereby place the valve in closed position.

A safety lock 80 is axially provided with a recess 81, an aperture 82 and bore 83. An end plug 84 provided axially with threads 85 has a shoulder portion 86. End plug 84 is located in aperture 82 with threads 85 rotatively engaging threads 61. A coil spring 87 is interposed between the shoulder portion 86 and the bottom of aperture 82. A lock nut 88 is rotatively mounted upon threads 85 so as to abut the end of stud 60 and hold stud 60 in adjusted position. Recess 81 is provided to accommodate the end of sleeve 54. Bore 83 permits stud 60 to slidably pass therethrough.

Reference is now made to FIG. 2, where it can be seen that sliding pins 90, 90A are slidably mounted in barrel 12. Barrel 12 is provided with indented walls 91 and 92 which provide recesses to accommodate a trigger, as will presently appear.

Safety lock 80 is provided with two cam surfaces 97, 98, having respectively, low points 97B and 98B. Two cavities 93, 94 are located in the high point of the respective cam surfaces 97, 98. Cavities 93, 94 are adapted to accommodate, respectively, balls 95, 96. The edges of the cavities 93, 94 are crimped to retain the balls 95, 96, respectively, therein. They expose the surface 80A of safety lock 80 and provide the high points for the respective cam surfaces 97, 98.

Sliding pins 90, 90A in inoperative position are located, respectively, at low points 97B, 98B. Rotation of safety lock 80 approximately ninety degrees causes cam surfaces 97, 98 to respectively, actuate sliding pins 90, 90A into operative position against balls, 95, 96.

In this manner, safety lock 80 is manually pushed away from barrel 12 against the tension of spring 87.

A trigger, generally indicated by reference numeral 100, consists of finger grip 101 and two legs 102 and 103 which form a yoke. A pintle 106 is fastened (see FIG. 3) in barrel 12 and projects beyond indented walls 91, 92 so that legs 102, and 103, respectively, can be accommodated in the respective recesses formed in the barrel by said indented walls. In this manner yoke 100 is pivotally mounted to barrel 12.

Hardened inserts 105, 106 may be provided, respectively in legs 102, 103 as wear resistant surfaces for the engagement, respectively, of the ends of sliding pins 90, 90A.

A trigger lock, generally indicated by reference numeral 107 comprises a bushing 108 fastened in leg 103, as by means of screw threads 109. Axially, bushing 108 is provided with a cavity 110 and a chamber 111, separated by a wall 112 having an axial bore 113.

A detent pin consisting of a shank 115, a head 116 and a shoulder 117 is slidably mounted in axial bore 113 with a coil spring 118 interposed between shoulder 117 and wall 112. A snap ring 119 positions shank 115 in cavity 110. An opening 20 in barrel 12 is aligned with and adapted to receive shank 115.

Reference is now made to FIG. 1. Passageway 16, in handle 11, is provided with a shoulder 121. A filter cartridge having an enlarged head 123, a threaded end 124, an axial opening 125 and a wall orifice 126 is located in passageway 16 with head 123 engaging shoulder 121. A retaining nut 122 provided with a fluid passageway 127 is rotatively mounted upon threaded portion 17A and rotatively engages threaded end 124 to removably secure the filter cartridge and head 123 in passageway 16. The filter material is left out for clarity of illustration, but is indicated by the dot and dash line.



A union assembly, generally indicated by reference numeral 130, is provided to receive a fluid supply conduit, not shown. The union assembly 130 consists of a T shaped fitting 131 having an axially located inlet port 132, a first shoulder 133 and a second shoulder 134. An externally threaded nut 135 having a cavity 136, a chamber 137, a wall 138 and an axial passageway 139, is rotatively connected to threaded portion 17A so as to retain T shaped fitting 131 in passageway 16 with the body of fitting 131 projecting through axial passageway 139. First shoulder 133 may engage the end of nut 135. Fluid packing 140 is located in cavity 136 with second shoulder 134 blocking one end of cavity 136.

A lock nut 142 provided with an axial passageway 143 aligned with axially located inlet port 132, is rotatively connected to the end of T shaped fitting 131 by means of screw threads 145. A washer 147 and a coil spring 148 located in chamber 137 and surrounding T shaped fitting 131 is interposed between wall 138 and the end of lock nut 142.

In operation, a fluid conduit may be attached to lock nut 142 at threaded area 150. The fluid under pressure will flow through passageway 143, inlet port 132, passageway 16 at 16A, fluid passageway 127, wall orifice 126, axial opening 125 into passageway 16 from where it will enter chamber 15 and pass through openings 68 to be blocked by valve plug 71 located in valve seat 28. This is the position of valve plug 71 as illustrated in FIG. 1, viz. valve closed position.

To place the valve in open position, trigger 100, through pressure applied to finger grip 101, is pivoted around pintle 104, whereby, inserts 105, 106, respectively, engage sliding pins 90, 90A which, respectively, engage balls 95, 96 to thereby move safety lock 80 in the direction of the arrow in FIG. 2. This movement pulls valve plug 71 away from valve seat 28 because stud 60 is fastened to safety lock 80 by means of end plug 84. Stud 60 is fastened to pin 63 by means of threads 62, 62A. Stud 60 fastened to flanged member 65 by means of threads 64, 64A pulls on needle valve 70 fastened in flanged member 65.

With the advent of the valve in open condition, the fluid flows past valve seat 28 into cavity 25 and through opening 52 into outlet extension 50, past sealing washer 45 and into and through outlet port 42 to the atmosphere.

If it is desired to maintain the valve in open position (see FIG. 3) then trigger lock 107 is actuated by pressing head 116 against the tension of spring 118 whereby shank 115 is lodged in opening 120. The tendency of coil spring 77 to force flanged member 65 and therefore, safety lock 80 in a direction opposite to the direction of the arrow in FIG. 2, creates friction through a wedging action on shank 115 because of the force applied to sliding pins 90, 90A by balls, respectively, 95, 96, acting, respectively, on inserts 105, 106 of trigger 100. In this manner the spring 77 tends to rotate trigger 100 in a clockwise direction as viewed in FIGS. 1 and 2.

When safety lock 80 is rotated so that the ends of sliding pins 90, 90A, lay in cam slots 97, 98 respectively, instead of against balls 95, 96, respectively, then spring 77 holds the valve in closed position. The pivotal movement of trigger 100 is then ineffective because sliding rods 90, 90A do not engage a surface on safety lock 80 such as, respectively, high point balls 95, 96, whereby safety lock 80 is moved in the direction of the arrow in FIG. 2.

In the modified form shown in FIGS. 8, 9, 10, 11 and 12 the airless spray gun, is generally indicated by reference numeral 10A, and comprises a housing having the general shape of fire arm pistol.

The housing comprises a handle 11A integrally attached to a barrel 12A, having a top bar 12B, located at an approximate right angle to the handle 11A. A cover 13B having a hook 13A is fastened to top bar 12B by means of screw 13C and a flange 13D located in a slot provided for that purpose in top bar 12B.

Barrel 12A is provided with aligned axial bores 14A and 14B. Bore 14A is provided with a wall 14C. Bore 14B is provided with threads 18C.

A bushing 150 is provided with a stepped axial passageway consisting of a first threaded area 151, a recess 152, a chamber 15A, a bearing 153, an enlarged bore 154 and a second threaded area 155. Bushing 150 is provided with a hollow channel 156 connected to chamber 15A. Bushing 150 is fastened in axial bore 14A by means of a drive fit and abuts wall 14C for purposes of alignment.

Handle 11A is provided with a passageway 16A which extends throughout the length of handle 11A and extends through top bar 12B to connect with hollow channel 156.

A filter casing 23A is externally provided with threads 18C and threads 24A. Threads 18C rotatively engage first threaded area 151. Axially casing 23A is provided with a cavity 25A and an inlet orifice 26A. A disk 27A provided with a valve seat 28A, abuts filter casing 23A at inlet orifice 26A with the valve seat 28A aligned with inlet orifice 26A. A fluid packing ring 32A located in recess 152 engages disk 27A to form a fluid tight seal under the force of filter casing 23A acting through disk 27A whereby the packing 32A is squeezed.

A front cap 35A having a stepped axial bore 36A provided with a circular abutment 37A and a threaded area 38A. Threaded area 38A rotatively engages threads 24A.

A spray tip 40A provided externally with a shoulder 41A and internally with an outlet port 42A is located in axial bore 36A with shoulder 41A engaging circular abutment 37A.

A filter cartridge 43A is located in cavity 25A with a sealing washer 44A and a second sealing washer 45A located on opposite sides of a circular ridge 48A on filter cartridge 43A. In this manner rotation of front cap 35A upon threads 24A forces the inside wall 46A of spray tip 40A against second sealing washer 45A which abuts circular ridge 48A forcing sealing washer 44A against the end of filter casing 23A, so as to permit fluid to flow past valve seat 28A into cavity 25A and through filter cartridge 43A into outlet port extension 50A aligned with outlet port 42A and an orifice in second sealing washer 45A provided for that purpose.

Filter cartridge 43A is shown with a screw 51A which blocks one end of outlet extension 50A, and an opening 52A. The filter material, is not shown for purposes of clarity in the drawing, but it is indicated by a dot and dash line. The filter material can be of any commercial type, such as wire mesh.

A sleeve 54A provided with a passageway 56A having a circular rim 57A is slidably mounted in axial bore 14B. A spring adjustment stop body 160 provided with an extension 161 is slidably mounted in axial bore 14B. A retaining nut 162 having an axial bearing 163 is rotatively connected to threads 18C with extension 161 slidably mounted in bearing 163. A knob 164 is fastened to the end of extension 161, as by means of a drive fit. A collar 75A having a stop 75B and an internal thread 75C is slidably mounted in passageway 56A with stop 75B engageable with circular rim 57A. A coil spring 77A is interposed between collar 75A and spring adjusting stop body 160. A pin 63A provided with a threaded end 62A and an opening 64A is fastened to collar 75A by means of threads 62A and 75C. A needle valve 70A having a valve plug 71A is fastened in opening 64A, by means of a drive fit, so that valve plug 71A may engage and disengage valve seat 28A. A fluid tight packing 73A is located in enlarged bore 154 and surrounds pin 63A. A packing nut 167 is rotatively attached to second threaded area 155 and is slidably mounted upon pin 163A.

Top bar 12B is provided with an opening 170 which leads to sleeve 54A. Opening 170 has threads 171. A detent, generally indicated by reference numeral 168, consists of a ball 172 located in the bottom of the opening 170 and against sleeve 54A which may be indented for the reception of ball 172. A coil spring 174 located in



opening 170 is spring pressed against ball 172 by means of plug 175 rotatively mounted in threads 171.

A trigger, generally indicated by reference numeral 100A, consists of a finger grip 101A, U shaped to provide two oppositely located legs 102A, 103A pivotally mounted upon a pintle 104A fastened in top bar 12B.

A trigger lock, generally indicated by reference numeral 107A comprises a leaf spring having two legs 180 and 181 pivotally mounted upon a stud 182 fastened in leg 102A. A latch finger 183 having an ear 184 is pivotally mounted upon stud 182 through ear 184. Leg 181 yieldingly engages latch finger 183 to urge latch finger 183 against the barrel 12A serving the function of a stop (see FIGS. 8 and 13).

Reference is now made to FIG. 8.

Passageway 16A is provided with an enlarged area in handle 11A so as to provide a shoulder 121A.

A bushing 190 provided with a hollow area 192, a circular recess 191 and a threaded portion 17AA is fastened in the enlarged area of pasageway 16A by means of a drive fit abutting shoulder 121A. A fluid packing 193 is located in circular recess 191. A filter cartridge having an enlarged head 123A, a threaded end 124A, an axial opening 125A and a wall orifice 126A is located in hollow area 192. A retaining nut 122A provided with a fluid passageway 127A is rotatively mounted upon threaded portion 17AA and rotatively engages threaded end 124A to removably secure the filter cartridge within hollow area 192. The filter material is left out for clarity of illustration, but is indicated by the dot and dash line.

A union assembly, generally indicated by reference numeral 130A, is provided to receive a fluid supply conduit, not shown. The union assembly 130A consists of a T-shaped fitting 131A having an axially located inlet port 132A, a first shoulder 133A and a second shoulder 134A. An externally threaded nut 135A having a cavity 136A, a chamber 137A, a wall 138A and an axial passageway 139A, is rotatively connected to portion 17AA so as to retain T-shaped fitting 131A in hollow area 192. First shoulder 133A may engage the end of nut 135A. Fluid packing 140A is located in cavity 136A with second shoulder 134A blocking one end of cavity 136A.

A lock nut 142A provided with an axial passageway 143A aligned with axially located inlet port 132A, is rotatively connected to the end of T-shaped fitting 131A by means of screw threads 145A. A washer 147A and a coil spring 148A located in chamber 137A and surrounding T-shaped fitting 131A is interposed between wall 138A and the end of lock nut 142A.

In operation, a fluid conduit may be attached to lock nut 142A at threaded area 150A. The fluid under pressure will flow through axial passageway 143A, inlet port 132A, hollow area 192, fluid passageway 127A, wall orifice 126A, axial opening 125A, passageway 16A to chamber 15A to be blocked by valve plug 71A engaging valve seat 28A. This is the position of valve plug 71A as illustrated in FIG. 8, viz, valve closed position.

To place the valve in open position, trigger 100A, through pressure applied to finger grip 101A, is pivoted around pintle 104A, whereby, bail 200, fastened to trigger 100A, engages the end of collar 75A to compress coil spring 77A. This movement withdraws valve plug 71A away from valve seat 28A through the connection of pin 63A with collar 75A.

Manual release of the trigger lock 107A, allows spring 77A, through bail 200 to pivot trigger 100A into valve closed position and valve plug 71A into engagement with valve seat 28A.

Having shown and described preferred embodiments of the present invention, by way of example, it should be realized that structural changes could be made and other examples given without departing from either the spirit or scope of the present invention.

What I claim is:

1. An airless spray gun comprising a housing having an axial bore, an inlet passageway leading to said axial bore, a disk having a valve seat, means at one end of said axial bore fastening said disk to said housing with said valve seat providing an exit from said axial bore, a needle valve having a valve plug on one end and a stud on the other end with said valve plug engageable and disengageable with said valve seat to open and close said exit, support means in the other end of said axial bore slidably mounting said needle valve in said axial bore, spring means supported in said housing, yieldingly urging said valve plug into engagement with said valve seat to close said exit, a safety lock having a cam surface with a high point and a low point, resilient means slidably mounting said safety lock upon said stud, a sliding pin, means slidingly mounting said sliding pin in said housing with one end of said pin located against said cam surface, a pintle fastened in said housing, a trigger swingingly mounted upon said pintle and engageable with the other end of said sliding pin, said safety lock rotatable into operative and inoperative positions, in operative position, movement of said trigger forces said sliding pin aganst said high point, whereby said sliding pin moves said safety lock and through said stud end needle valve, moves said valve plug away from said valve seat, to open said exit and in inoperative position said sliding pin engages said low point, whereby said safety lock remains unmoved.

2. An airless spray gun as claimed in claim 1 wherein a trigger lock removably attaches said trigger to said housing to hold said trigger in operative position, said trigger lock comprising a bushing axially provided with a cavity and a chamber, with a wall having an axial bore separating said cavity from said chamber, means fastening said bushing to said trigger, a detent pin having a head and a shank, said shank slidably mounted in said axial bore, spring means in said chamber between said wall and said head means slidingly retaining said shank in said bushing, an opening in said housing aligned with said shank in trigger lock position, wherein, said shank engages said opening to retain said trigger in operative position.

3. An airless spray gun as claimed in claim 1, wherein, a filter casing having a cavity and an inlet orifice removably attaches to said housing at said axial bore, a washer, said washer and said filter casing constituting the means for fastening said disk to said housing in fluid tight relationship with said disk located in said inlet orifice, a front cap having a bore, means fastening said front cap to said filter casing with said bore aligned with said cavity, a spray tip having an outlet port, means removably attaching said spray tip to said front cap with said outlet port aligned with said bore, and a filter cartridge provided with an outlet extension located in said cavity with said outlet extension connecting said cavity with said outlet port and means removably supporting said filter cartridge in said cavity.

4. An airless spray gun as claimed in claim 1, in which said support means slidably mounting said needle valve in said axial bore comprises a flanged member provided with a spring seat and a plurality of openings located in said axial bore, means removably fastening said flanged member to said needle valve, and a sleeve having a passageway located in said bore with said stud slidably mounted in said passageway, means removably securing said sleeve to said housing, fluid packing, a collar located in said axial bore, means removably securing said packing and collar in said axial bore, said needle valve slidably supported in said fluid packing and collar, and said spring means surrounding said needle valve and interposed between said flanged member and said collar.




**References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 1,706,875 | 3/1929 | Downs | 239—415 |
| 1,980,464 | 11/1934 | Yedd | 239—583 |
| 2,208,850 | 7/1940 | Mayer | 239—583 X |
| 2,845,301 | 7/1958 | Martin | 239—583 X |
| 2,937,813 | 5/1960 | Rinkerwich | 239—459 |
| 2,953,841 | 9/1960 | Bullock | 239—583 X |
| 3,409,044 | 11/1968 | Sobek et al. | 239—414 X |



LLOYD L. KING, Primary Examiner

U.S. Cl. X.R.

239—583