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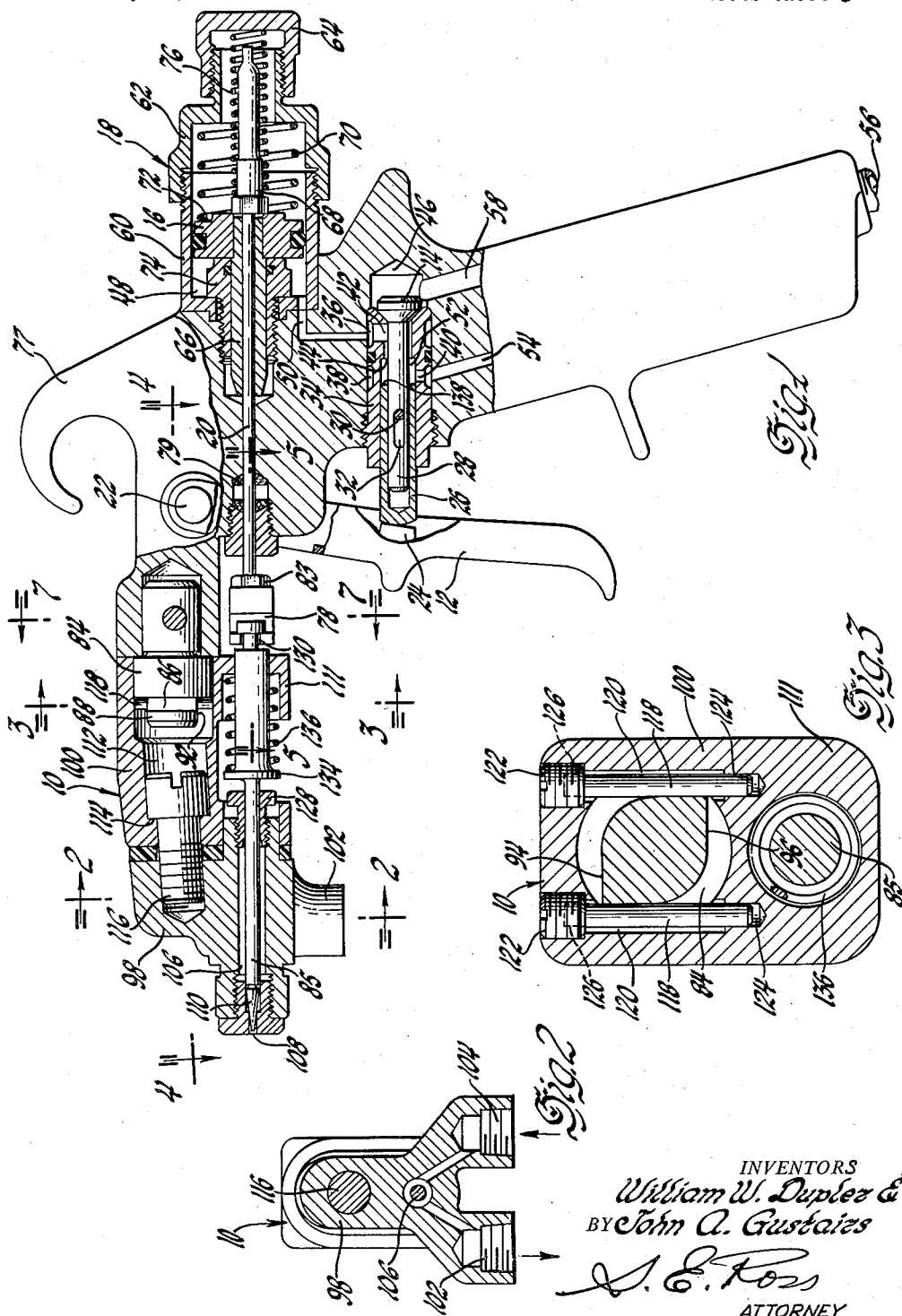
W. W. DUPLER ET AL

2,991,940

PAINT SPRAY GUN WITH DETACHABLE HEAD

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2 Sheets-Sheet 1



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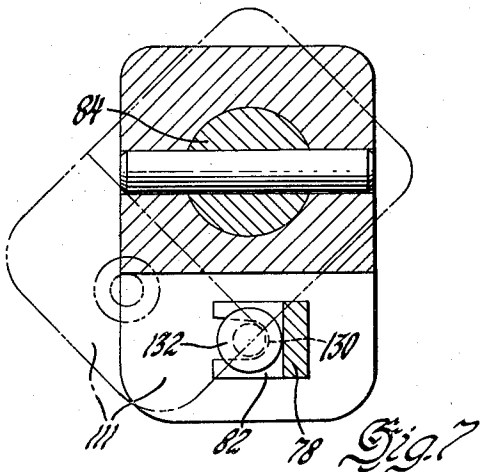
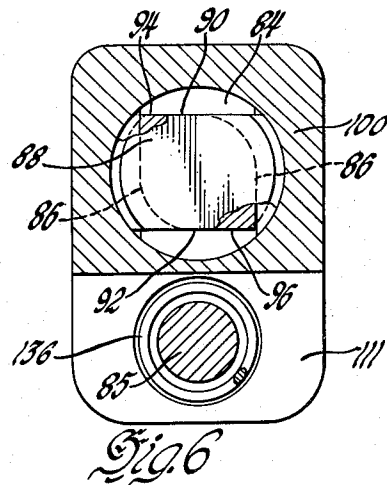
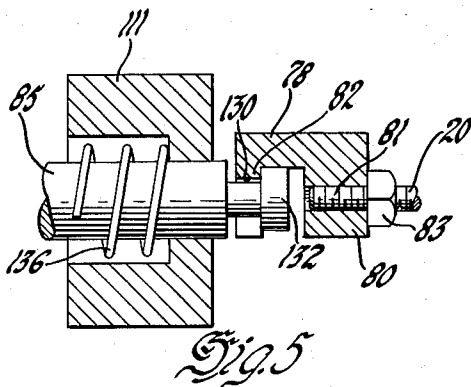
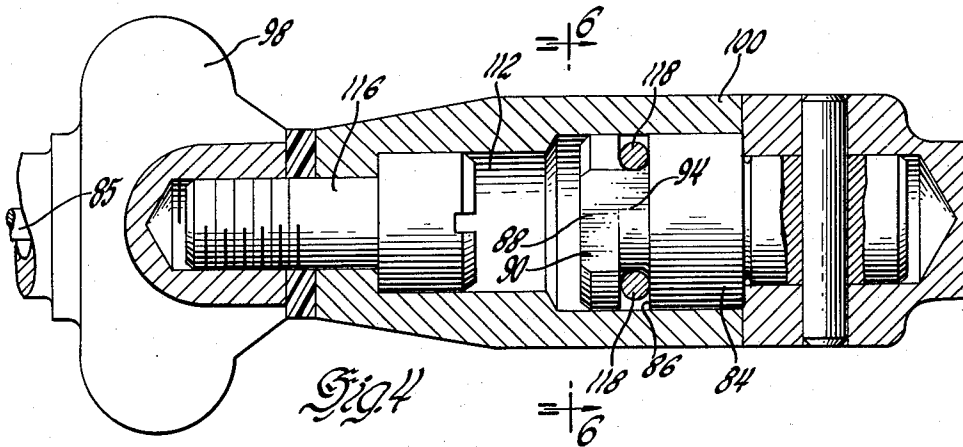
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PAINT SPRAY GUN WITH DETACHABLE HEAD

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PAINT SPRAY GUN WITH DETACHABLE HEAD
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poration, Detroit, Mich., a corporation of Delaware
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This invention relates to a spray gun of the type particularly adapted to the application of surface coatings, such as paint, lacquer, or the like; and more specifically, this invention relates to a readily detachable, unitary gun head assembly therefor.

Commercially, surface coatings of paints, lacquers, or the like are customarily applied by spraying. Such spraying is often performed employing a production line system wherein a moving line of articles passes a fixed spraying station. Each article is sprayed individually as it passes the spraying station.

Although the employment of the production line system increases the rate of production, it causes a problem when multi-colored articles are sprayed or when succeeding articles in the moving line are of different colors. The rapid pace of a production line does not allow sufficient time to conveniently interchange the color which a particular gun is equipped to spray, but necessitates employing a separate spray gun for spraying each individual color that is to be used. When a production line is employed to spray automobile body parts, for example, each succeeding article in the moving line very often is painted a color different from the article sprayed before it. More than 20 colors are often employed and must therefore be available at each spray station. Consequently, 20 spray guns must be employed for each man working at each spray station in order that he might perform his particular function in the spraying operation.

It is one of the objects of this invention to reduce the number of spray guns required at a production line spray station to spray a variety of colors. It is also an object of this invention to provide a spray gun having a readily detachable, unitary head assembly operatively attached to a working handle.

More specifically, it is an object of this invention to provide a readily detachable, unitary gun head assembly for a spray gun in which the head assembly contains an operative spring-biased control valve.

Other objects, advantages and features of the present invention will appear more clearly in the following description of a preferred embodiment thereof and from the drawings, in which:

FIGURE 1 shows a side elevational view in partial section of a spray gun comprehended by the invention;

FIGURE 2 is an enlarged sectional view along the line 2-2 of FIGURE 1;

FIGURE 3 is an enlarged sectional view in partial elevation along the line 3-3 of FIGURE 1;

FIGURE 4 also is an enlarged sectional view with parts in elevation along the line 4-4 of FIGURE 1;

FIGURE 5 is an enlarged view along the line 5-5 of FIGURE 1;

FIGURE 6 is a sectional view along the line 6-6 of FIGURE 4; and

FIGURE 7 is an enlarged sectional view partly in elevation along the line 7-7 of FIGURE 1.

Briefly, the invention comprehends a spray gun having a readily detachable, unitary gun head assembly secured to a working handle which has contained therein an operative control valve actuator. The head assembly is secured to the handle by a bayonet joint which provides a suitable fastening means which can quickly be disconnected. The head assembly, including a barrel member and a paint

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head, possesses an operative spring-biased control valve which has a stem thereon. The end of the stem is suitably adapted to operatively engage with a coupling means on the control valve actuating means of the working handle. The control valve stem of the head assembly is simultaneously brought into operative engagement with the control valve actuator on the handle when the head assembly is secured to the handle.

The spray gun shown in the drawings is specifically constructed for the "airless" method of spraying paint, lacquer or the like. In this method, air is not employed for atomizing the paint. Generally, the "airless" method of spraying paint, lacquer, etc., utilizes a spray gun in which the paint is continuously circulated under pressure and, usually, at an elevated temperature through a paint head. The paint head has an inner chamber through which the paint is circulated. A valve opening in a wall of the chamber forms a paint exit nozzle in the paint head. The fluid paint, being under pressure, is forced out of the nozzle when the controlling valve is opened. As the paint passes through the small diameter nozzle, a mechanical intermixing occurs which atomizes the paint. There is a substantial decrease in the pressure exerted on the paint as it is ejected from the chamber. Accompanying the large pressure reduction is a rapid vaporization of volatile paint components which assists in further atomization of the paint.

Referring now to the drawings, FIGURE 1 shows a spray gun having a head assembly 10 such as contemplated by the invention. As shown in FIGURE 1, the control valve actuating mechanism within the working handle is operated by compressed air and it is generally comprised of a trigger 12, a check valve 14 to control the entrance of compressed air into the handle, and an annular piston 16 in a cylinder indicated generally at 18 which are suitably constructed to motivate a control valve stem extension 20.

The trigger 12 is forked at its upper end, straddling an upper part of the handle, and is pivotally mounted thereon by means of a pin 22 extending transversely through the handle. A lower part 24 of the trigger 12 below the fork abuts against a cylindrical sleeve-type follower and valve actuator 26. A check valve 14, having a stem 28 formed thereon, is operated by action of the trigger on the follower 26. The follower is loosely fitted over the check valve stem 28 to permit relative movement therebetween and is secured thereto by means of a pin 30. The pin passes through a slotted opening 32 in the valve stem 28, thereby permitting limited relative movement of the sleeve 26 on the valve stem before actuating the check valve 14.

Circumferentially surrounding the check valve stem and the sleeve-type follower is an annular guide 34 which has two adjacent circumferential grooves 36 and 38 around its outer cylindrical periphery. Through the base of each groove is a transverse bore 40 and 42 extending into the inner diameter of the annular guide 34. The inner wall 44 of the valve guide is radially spaced from the valve stem 28, thereby providing an intercommunicating passage for air between the grooves as well as a passage for air from the valve chamber 46 into the groove 36 adjacent the valve when the valve is open. The groove 36, adjacent the check valve head 14 communicates with the piston chamber 48 by means of a connecting passage 50 in the handle. The other circumferential groove 38, being positioned over a counterbore 52 in the inner wall 44 of the valve guide, communicates therewith by means of the transverse bore 40. An exhaust passage 54 extending from a port in the lower end of the handle (not shown) is also in communication with the counterbore 52 via the circumferential groove 38 over the counterbore and the transverse bore 40 therein.

An opening 56 in the lower end of the handle is con-

ected to the valve chamber 46 in a central part of the handle surrounding the check valve 14 by means of a passage 58. A conduit (not shown) for supplying compressed air is suitably connected to the opening 56 in the lower end of the handle. Compressed air introduced into the lower opening of the handle by the conduit passes through the connecting passage into the valve chamber.

Secured to the upper rear portion of the handle are cylindrical members 60, 62 and the threaded end cap 64 which comprise the cylinder generally indicated at 18, forming a chamber 48 for an annular piston 16 contained therein. A shaft 20, forming a control valve stem extension, extends from the forward part of the handle into the piston chamber 48 through an elongated guide 66 which projects into the inner diameter of the piston 16. The contact valve stem extension 20 has an enlargement 68 thereon which in the inoperative position is maintained in abutment with the end walls of both the guide 66 and the piston 16. The piston is fitted on the guide loosely enough to permit relative movement but yet still maintain an adequate seal therebetween. The piston chamber 48 is in communication with the check valve 14 by means of the passage 50 in the body of the handle. A large coil spring 70 bearing against an end wall 72 of the piston urges the piston against an abutment 74 in the forward section of the cylinder. A smaller diameter coil spring 76, positioned coaxially with the larger diameter spring 70, presses on the enlargement 68 on the valve stem extension 20, urging the extension forward so that the enlargement 68 is in abutment with the guide 66 and the piston 16. An adjustment of the compression of the small coil spring 76 on the valve stem extension can be accomplished by means of a threaded end cap 64 on the rear of the cylinder.

A hook 77 is formed in the top of the handle to provide a convenient means with which to suspend the gun from a suitable support when it is not in use.

FIGURES 1, 5 and 7 show that the end of the control valve stem extension 20 opposite the piston chamber and adjacent a stuffing gland 79 is secured to a generally U-shaped coupling yoke 78. One wall 80 of the yoke is secured to the end of the extension, preferably by threaded means 81 and a lock nut 83 to permit adjustment. The other wall 82 of the yoke is slotted to receive the end of a control valve stem 85 in the head assembly. The coupling yoke 78 provides the interconnecting means between the control valve actuator in the handle and an operative spring-biased control valve 110 in the head assembly.

A generally cylindrical locking piece 84 is secured to an upper part of the forward section of the handle, forming part of a bayonet joint whereby the head assembly 10 is attached to the handle. As seen in FIGURES 1, 3 and 4, the locking piece is deeply grooved at 86 near its end in such a manner as to form a cam-like circumferential contour or locking cam on the base of the groove. The head 88 formed on the end of the cylindrical member by the groove 86 is adapted, as shown in FIGURE 6, by forming parallel planar surfaces 90 and 92 on its outer cylindrical periphery corresponding to opposing planar contours 94 and 96 of the locking cam.

The detachable head assembly comprises a continuous-flow, hot paint head 98, such as is normally employed in "airless" hot paint spraying, secured to a rectangular barrel member 100 which is in turn secured to the operating handle.

The hot paint head 98 consists of a body member having outlet 102 and inlet ports 104 communicating with an inner chamber 106. The forward wall of the chamber has an opening 108 therein, forming a nozzle which is sealed by means of the spring-biased control valve 110, the stem of which projects through the rear wall of the paint head below the barrel. A guide 111 for the valve stem depends from the end of the barrel 100 opposite the paint head. The paint head is secured to the barrel por-

tion of the head assembly by means of a bolt 116. Opening of the control valve 110 allows paint, circulating through the chamber 106 under pressure, to exit the chamber via the nozzle 108.

The barrel or adapter member 100 of the head assembly, shown in FIGURES 1, 3 and 4, is an elongated rectangular member having a generally central bore 112 running longitudinally therethrough. The bore does not extend completely through the barrel but leaves one end wall 114 through which a bolt 116 is placed to secure the paint head 98 to the barrel 100. Disposed in the longitudinal bore are the engaging members of the bayonet joint which coact with the locking piece on the handle to secure the head assembly thereto. Generally parallel locking pins 118 are transversely positioned on opposite sides of the bore within the barrel in such a manner that they pass through the outer circumferential extremities of the central bore 112. The locking pins 118 are suitably contained in transverse bores, the intermediate longitudinal extremities 120 of which are of a larger diameter than the ends. The pins are loosely retained therein by means of suitable threaded members 122. The locking pins can be suitably contained, as shown in FIGURE 3, through the employment of a counterbore 124, the upper extremity of which is threaded to receive a threaded locking pin retainer 122. As shown in FIGURE 3, the pin retainer has a recess 126 in its lower end wall to receive and secure the upper end of the locking pin. Thus, the pin is secured at each end but is free to move laterally in its intermediate longitudinal extensions. The locking pins are preferably made of a spring-type wire and therefore can be subjected to distortion without a detrimental effect.

The control valve stem 85 projects through a stuffing gland 128 in the rear wall of the paint head and extends longitudinally below the barrel so that its ends project through a guide means 111 depending therefrom. There is a circumferential groove 130 in the cylindrical periphery of the stem adjacent its end forming a head 132 thereon.

The control valve stem 85 has an enlarged portion 134 in its section between the guide means 111 and the paint head 98. A coil spring 136 longitudinally disposed around the control valve stem 85 has one end abutting the enlargement 134 and the opposite end of the coil spring abutting against the guide means 111, thereby spring biasing or loading the control valve and urging it to a closed position. The spring loading of the control valve provides the means whereby the valve is automatically urged to return to the closed position after being opened. The head assembly, therefore, contains an operative spring-biased control valve which closes automatically, permitting the paint head 98 to have paint circulating therethrough even when not attached to a handle.

In order to secure the head assembly to the handle, the cylindrical locking piece 84 is inserted into the central bore 112 of the barrel. The parallel flat sides 90 and 92 of the head pass between the locking pins 118. Upon rotation of the head assembly approximately 90° with respect to the handle, the cylindrical portions of the head on the locking piece and the cam-like base of the groove 86 come into positive engagement with the locking pins.

The locking pins being transversely disposed in the barrel permit passage of the head of the locking cam therebetween; however, engage same upon rotation of the locking piece. The distance between the locking pins is slightly smaller than that between the parallel surfaces of the locking cam so that a positive force is exerted thereon which seats the cam more securely on the pins and inhibits an unlocking rotation of the cam. Rotation of the barrel portion 90° with respect to the handle will allow engagement of the locking cam with the locking pins slightly distorting the pins to provide a more permanent engagement therewith.

As the head assembly is rotated into engagement with the locking cam, the control valve stem is simultaneously

attached to the valve stem extension 20 in the handle. As shown more clearly in FIGURES 5 and 7, the head 132 on the end of the valve stem 85 is moved into engagement with the coupling yoke 78 on the end of the extension. The slotted coupling yoke serves as a dog which slips into the annular groove 130 around the valve stem, thereby engaging the head 132 on the end of the valve stem to operatively connect the control valve actuating mechanism in the handle to the control valve in the head assembly.

In operation, movement of the trigger actuates the sleeve-type follower 26, thereby sealing off the exhaust passage 54 and subsequently opening the check valve 14 to admit compressed air through the valve and the passage 50 in the handle into the piston chamber 48. The compressed air in the piston chamber actuates the piston 16 which, abutting the enlargement 68 on the valve stem extension 20, causes a related movement therein. Since the extension is in operative engagement with the control valve stem 85 of the head assembly, movement of the extension opens the control valve 110. Paint continuously circulating through the paint head 98 is thereby allowed to exit the inner chamber 106 of the paint head via the nozzle 108.

When the control valve is opened, the piston 16 and the valve stem extension 20 in the handle, as well as the valve stem 85 in the head assembly, exert compressive forces on the related coil springs 70 and 76 in the handle and the spring 136 in the head assembly. Upon a release of the trigger, the pressure of the compressed air on the face of the check valve 14 closes same. The pressure of the compressed air in the piston chamber and connecting passage acts on the end face 138 of the check valve actuator 26. The actuator thereby is moved outwardly, exposing the exhaust passage 54, exhausting the compressed air from the piston chamber 48. The compressed coil springs 70, 76 and 136 subsequently exert a force on the piston 16 and control valve stem extension 20 in the handle and on the valve stem 85 in the head assembly, returning them to the normal inoperative position and closing the control valve 110 stopping the flow of paint therethrough.

Although this invention is particularly suited to be employed with spray guns of the "airless" type and has been illustrated with a specific example thereof, it is understood that no limitation is intended herein except as defined by the appended claims.

We claim:

1. In a spray gun, a handle having a control valve actuating mechanism including a valve stem extension, a gun head assembly including a paint head having a nozzle and a spring-biased control valve adapted to normally close said nozzle, means for detachably securing said head assembly to said handle including a locking piece on said handle having a circumferential groove with cam surfaces on the base of said groove and a member on said head assembly having transversely disposed locking pins adapted to be received within said groove and frictionally engage said cam surfaces when said head assembly is rotated with respect to said handle, and means for coupling said valve actuating mechanism to said control valve including interengaging parts on said valve stem extension and said control valve adapted to be operatively connected together upon rotation of said head assembly with respect to said handle to provide for operation of said control valve by said actuating mechanism.

2. In a spray gun having a separable handle unit and nozzle unit, control means provided on said handle unit, actuating linkage extending from said control means to said nozzle unit, separable fastener means interconnecting portions of said actuating linkage, said separable fastener means being actuable between a connected position and a disconnected position by a rotative movement of said nozzle unit of less than a full turn (360°), bayonet-type fastening means interconnecting said handle unit

and said nozzle unit and being actuable between a connected position and a disconnected position by a rotative movement of said nozzle unit of less than a full turn (360°), and said separable fastener means and said bayonet-type fastening means being spaced and positioned so as to be simultaneously actuable between the connected positions and the disconnected positions by rotative movement of said nozzle unit of less than a full turn (360°).

3. In a spray gun having a separable handle unit and nozzle unit, control means provided on said handle unit, actuating linkage extending from said control means to said nozzle unit, separable fastener means interconnecting portions of said actuating linkage, said separable fastener means comprising a yoke member and a pin member, locking means provided on said yoke member to receive and retain said pin member, said separable fastener means being actuable between a connected position and a disconnected position by rotative movement of said nozzle unit of less than a full turn (360°), said locking means adapted to prevent axial movement of said pin member in said connected position, said yoke member having a lateral slot to accommodate movement of said pin member during actuation of said fastener means between said connected position and said disconnected position, bayonet-type fastening means interconnecting said handle unit and said nozzle unit and being actuable between a connected position and a disconnected position by a rotative movement of said nozzle unit of less than a full turn (360°), said separable fastener means and said bayonet-type fastening means being spaced and positioned so as to be simultaneously actuable between the connected positions and the disconnected positions by rotative movement of said nozzle unit of less than a full turn (360°).

4. In a spray gun having a separable handle unit and a nozzle unit, control means provided on said handle unit, actuating linkage extending from said control means to said nozzle unit, separable fastener means interconnecting portions of said actuating linkage, said separable fastener means being actuable between a connected position and a disconnected position by a rotative movement of said nozzle unit of less than a full turn (360°), bayonet-type fastening means interconnecting said handle unit and said nozzle unit and being actuable between a connected and a disconnected position by a rotative movement of said nozzle unit of less than a full turn (360°), said bayonet-type fastening means comprising a slot provided in one of the units, a stud member provided on the other of the units, spaced pin members fastened to said one of the units and intersecting said slot, said stud member being contoured for axial movement into said slot between said spaced pin members, flange means provided on said stud member and being engageable with said spaced pin members by rotation of said stud member after axial movement thereof inwardly into said slot, and said separable fastener means and said bayonet-type fastening means being spaced and positioned so as to be simultaneously actuable between the connected positions and the disconnected positions by rotative movement of said nozzle unit of less than a full turn (360°).

5. In a spray gun having a separable handle unit and nozzle unit, control means provided on said handle unit, actuating linkage extending from said control means to said nozzle unit, separable fastener means interconnecting portions of said actuating linkage, said separable fastener means comprising a yoke member and a pin member, locking means provided on said yoke member to receive said pin member to prevent axial movement thereof, said separable fastener means being actuable between a connected position and a disconnected position by rotative movement of said nozzle unit of less than a full turn (360°), a lateral slot provided on said yoke member to accommodate movement of said pin member between said connected position and said disconnected

position, bayonet-type fastening means interconnecting said handle unit and said nozzle unit and being actuatable between a connected position and a disconnected position by a rotative movement of said nozzle unit of less than a full turn (360°), said bayonet-type fastening means comprising a slot provided in one of the units, a stud member provided on the other of the units, spaced pin members fastened to said one of the units and intersecting said slot, said stud member being contoured for axial movement into said slot between said spaced pin members, flange means provided on said stud member and being lockingly engageable with said spaced pin members by rotation of said stud member after axial movement thereof inwardly into said slot, and said separable fastener means and said bayonet-type fastening means being spaced and positioned so as to be simultane-

ously actuatable between the connected positions and the disconnected positions by rotative movement of said nozzle unit of less than a full turn (360°).

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