May 2, 1944. W. M. SPRENG 2,347,755

SPRAY GUN VALVE

Filed July 15, 1940 2 Sheets-Sheet 1

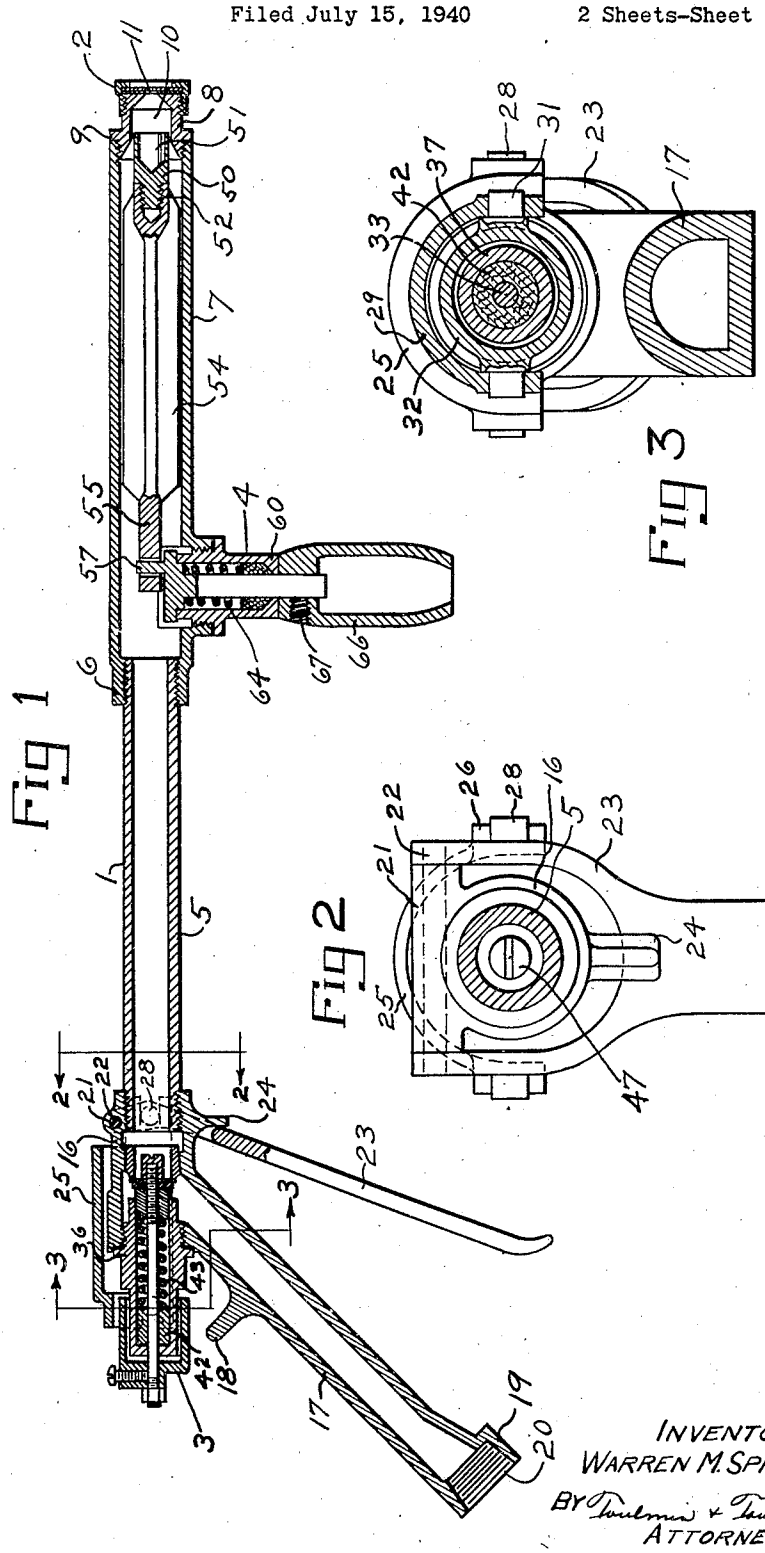


Fig 1

Fig 3

Fig 2

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Fig 4

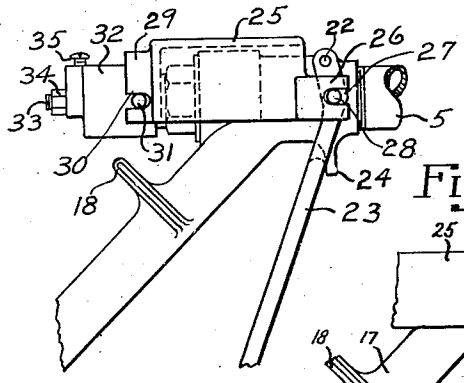


Fig 5

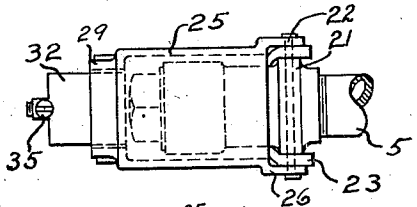


Fig 8

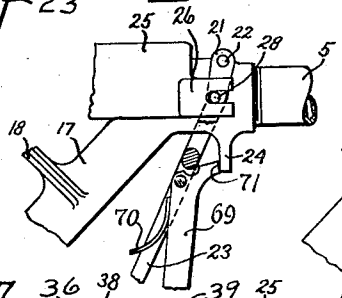


Fig 9

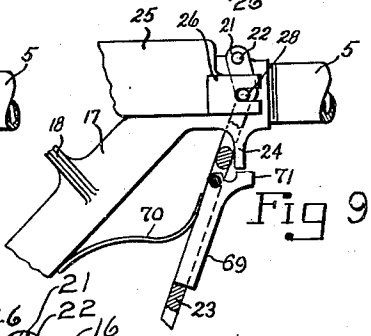
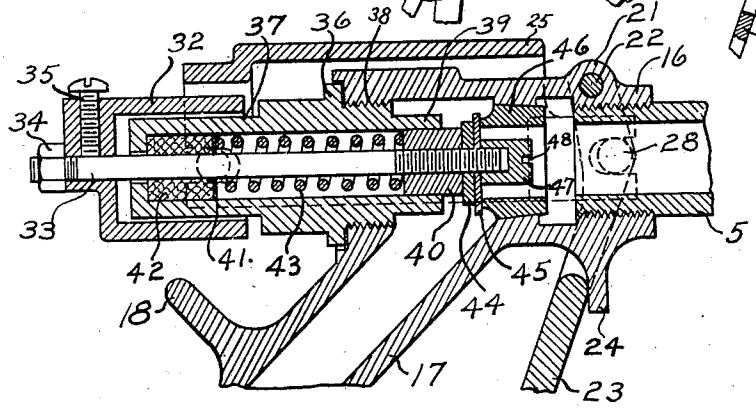


Fig 6



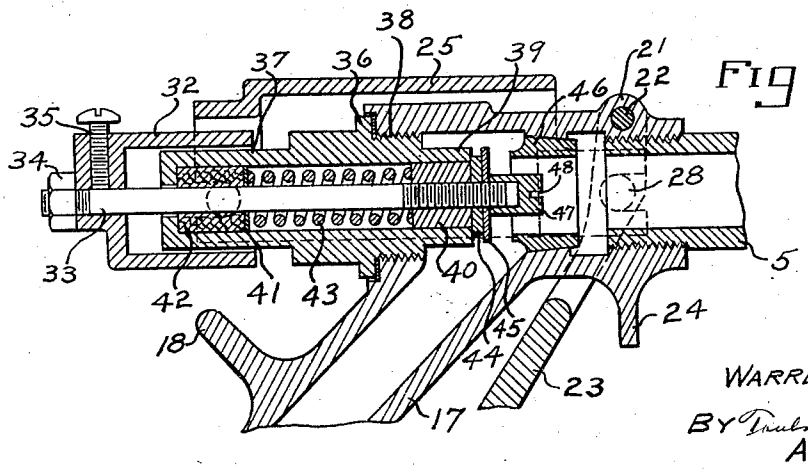


Fig 7

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2,347,755

SPRAY GUN VALVE

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Application July 15, 1940, Serial No. 345,519

5 Claims. (Cl. 251—134)

The present invention relates to a valve for spray guns for distributing solutions over surfaces, and particularly for applying insecticides over plants, bushes and trees.

The usual form of spray gun is constituted of a barrel of a varying length, depending upon the use to which the gun is put, the barrel terminating at one end in a nozzle cap and at the other end in some form of a fluid shut-off. There is only one grip provided and that appears at the shut-off end, but there is no provision for adjusting the amount of shut-off to accommodate wear. Neither is there any provision for adjusting the maximum opening of the valve at the shut-off end, or the tightness with which the valve is clamped on its seat.

The entire weight of the long barrel, assuming that trees are being sprayed and call for a considerable length of barrel, is carried solely by the grip at the shut-off and in case spray fluids of considerable pressure and velocity are being handled by the gun, the user of the device finds the spraying work exhaustive.

Again, in case it is desired to change the size of the spray in guns of the unimproved type, it is usually necessary to remove the nozzle for the purpose of replacing the apertured disc in the nozzle by a disc having a different sized opening and the work of making this change can be accomplished only while the spray gun is not in use.

The primary object of the present invention is to provide an improved spray gun in which two grips are employed, one of the grips being positioned at the end of the barrel and constituting an improved trigger structure and in which the force with which the valve is clamped on its seat is controlled when the trigger is moved to its shut-off position. There is also a provision for controlling the maximum valve opening when the trigger is moved to the open position. The other grip handle is positioned intermediate the ends of the barrel where it can be readily held by the hand of the user, and there is provided a simple and sturdy mechanism at this handle for regulating the character of the spray ejected by the nozzle end of the barrel. Thus, the spray may be controlled while the gun is in continuous use and the same device that regulates the spray also serves as a second grip for supporting the barrel.

It has been found in the ordinary form of spray gun, particularly when using certain forms of corrosive solutions and lumping mixtures, various parts of the gun may become rusted, corrosively attacked, or clogged, so that it is necessary to take the gun apart to replace or clean these parts. Moreover, many of the spray guns on the market are fabricated in as few parts as possible, using welded joints so that replacement of parts becomes a factory job, thus delaying the spraying operation at a time when it is needed the most.

Accordingly, a still further object of my invention is to provide an improved gun in which the parts are not only as few and simple as possible, made of metal which does not lend itself to chemical attack but the parts may be readily detached from one another so that the user can instantly take the gun apart for either cleaning or replacement purposes.

Other objects and features will be apparent as the following specification is perused in connection with the accompanying drawings, in which:

Figure 1 represents a longitudinal cross sectional view of the complete gun.

Figures 2 and 3 are enlarged sections taken along lines 2—2, 3—3 respectively in Figure 1 and looking in the direction of the arrows, as indicated.

Figure 4 is a fragmentary side elevational view of the shut-off trigger end of the gun.

Figure 5 is a plan view of the structure shown in Figure 4.

Figure 6 is a longitudinal sectional view, somewhat enlarged, of the shut-off valve mechanism and trigger for operating the same. The trigger is shown in the closed valve position.

Figure 7 is a view similar to Figure 6, but showing the trigger in the open-valve position.

Figure 8 is a fragmentary elevational view of a modified form of the trigger end of the gun. This figure shows the relative positions of the various parts when the valve is open.

Figure 9 is a view similar to Figure 8 but showing the parts in a valve-closed position.

Referring more particularly to Figure 1, the improved spray gun is constituted essentially of four main parts, namely, the barrel which is generally designated by the reference character 1, the nozzle indicated 2 and positioned at one end of the barrel, the trigger shut-off 3 at the other end of the barrel, and the spray control mechanism 4 positioned intermediate the ends of the barrel.

The barrel 1 is made up of as many lengths of piping as may be desired and, as indicated, there are two lengths formed by the tubing 5

which is screwed as at 6 into the tubing of larger diameter indicated at 7.

The nozzle 2 consists of a head casting or screw cap 8 having an hexagonal head indicated at 9, and a bore 10 which tapers down to a smaller opening indicated at 11. There is a cap which screws over a small diameter portion of the member 8, this cap serving to clamp a pair of washers to the right hand end of the member 8. One washer is made of rubber and constitutes a gasket, and the other washer is composed of a hard non-corrosive metal having a very small opening through which fluid issues as a spray.

The trigger shut-off 3 is constituted of the following elements: The left hand end of the pipe 5 is screwed into a casting which is formed of a cylinder 16, from which extends a hollow handle element 17 having an upstanding projection 18 and a U-shaped cross section, as indicated in Figure 3. The lower end of the handle 17 terminates in a circular portion 19, which has internal threads 20 for accommodating the end of a screw pipe or hose (not shown) leading to a source of spray solution held under pressure in any suitable and well known manner.

The cylinder 16 is provided with a projection 21 having an opening to receive a pin 22 (Figures 6 and 7) which serves as a pintle or pivot for a bifurcated trigger handle 23, the furcations of which span the ends of the projection 21 (Figure 2), so that the pin 22 permits the handle 23 to move toward and away from the handle 17. The cylinder 16 is provided with a downwardly extending lug 24, which serves as a stop for the trigger handle 23, as can be seen in Figures 1 and 6.

The lower surface of the handle 17 and the upper surface of the trigger handle 23 are preferably so shaped that when the composite handle is gripped the two handle elements may be readily accommodated within the hand.

Surrounding the upper part of the cylinder 16 is a hollow shield 25 of semi-circular configuration, the right hand end of the shield terminating at each side of the shield in a square boss extension 26 (Figures 4 and 5) which are slotted, as indicated at 27, to receive pins 28, which are integrally secured to the trigger handle 23. Consequently, by moving the trigger 23 in the direction of the handle 17 the pin 28 is caused to move to the left, moving the shield 25 in the same direction. The latter, at the left hand end, terminates in a cylindrical extension 29 which is provided with diametrically positioned slots 30 which receive pins 31, the latter being integrally secured to a cylindrical housing 32, which has an opening for carrying a rod 33 threaded at each end. A nut 34 is screwed to one end of the rod, and the purpose of this nut will be explained hereinafter. A screw 35 passes through the housing 32 to maintain a rigid position between the housing 32 and the rod 33.

Within the shield 25 and the housing 32 there is a sleeve having an hexagonal portion 36 which terminates at one end in a closed cylindrical portion 37 having an opening through which the rod 33 extends. The opposite end of the sleeve is provided with a screw portion 38 and a portion of smaller diameter 39 (Figures 6 and 7). The portion 39 is closed by a slidably fitted plug 40 through which the rod 33 loosely extends. The opposite end of the sleeve 36 contains a washer 41 and packing material 42, and between the washer 41 and the plug 40 there is a compression spring 43 loosely mounted about the rod 33. It will be noted that the spring 43 bears against the packing 42 and thus annoying leakage is automatically prevented and it is never necessary for the operator to tighten up packing glands which is the usual practice with spray guns of the prior art. Next to the plug 40 on the right (Figures 6 and 7) there is a rubber washer 44 and a metal washer 45 made of non-corrodible material which serves as a valve diaphragm for opening and closing the passageway into the gun.

The diaphragm 45 is adapted to be seated against the left hand side of a turned sleeve 46 which is securely pressed into place within a tapered bore of the cylinder 16. The diaphragm is held in position on the rod 33 by an internally threaded cap member 47 having a slot 48 to receive the end of a screw driver during assembly of the valve mechanism. From the foregoing, it is evident that by moving the trigger 23 to the left, as indicated in Figure 7, the shield 25 moves in the same direction due to the action of the pins 28 in the slots 27 causing the housing 32 to move also to the left and to exert a push in the left hand direction on the nut 34.

The rod 33 is therefore moved to the left carrying with it the cap screw 47 and the diaphragm 45 and causing the plug 40 to move to the left relative to the sleeve 36. Thus the spring 43 is compressed and the action of the trigger 23 is to move the diaphragm 45 from its seat against the compressing action of the spring. It is apparent that by tightening up the nut 34, the distance between the left hand end of the sleeve 36 and the diaphragm 45 is foreshortened so that for a given left hand travel of the trigger 23 the diaphragm is moved farther from its seat.

Viewing it from another aspect, the tightening of the nut 34 serves to move the trigger 23 counter-clockwise due to the increased tension of the spring 43, so that when the trigger is moved from its extended right hand position to its left hand position, i. e. abutting the under surface of the handle 17, a greater movement is given to the diaphragm 45 causing the latter to move farther from its seat. Thus, the nut 34 controls the maximum opening of the valve.

In accordance with another feature of my invention, there is provided an additional control of the valve in that the force to be applied by the trigger in breaking the diaphragm from its seat, and therefore the amount of pressure necessary to start opening the valve can be adjusted by regulating the relative longitudinal position of the sleeve 36 and the cylinder 16.

When the hexagonal head 36 is tightened, the cylinder 37 is caused to move to the right with respect to the cylinder 16, producing further compression of the spring 43. This causes the diaphragm 45 to be pressed more tightly against its seat, thereby causing greater effort at the trigger 23 for moving the valve from its seat. Thus, I have provided two control features at the trigger end of the gun in that the nut 34 serves to regulate the maximum opening of the valve after it has been moved from its seat by the trigger 23 and the hexagonal nut on the sleeve 36 serves to regulate the force to be applied at the trigger 23 for breaking the seal between the diaphragm and its seat. Both of these features are readily accessible to the user of the gun since the nut 34 is entirely external of the parts, while the hexagonal portion of the sleeve 36 is accessible from the under side of the shield 25, which as

has been pointed out hereinbefore is of a hollow semi-cylindrical configuration, therefore entirely open at the bottom.

Operation of the shut-off valve

Assuming that a spray solution under pressure is forced through the handle assembly 17 of the gun from a spray pump (not shown), the handle 17 and the trigger 23 are grasped in one hand and compression is applied to move the trigger away from the stop 24 and to the left. Under these circumstances and assuming that the proper longitudinal adjustment of the sleeve 36 has been made, the diaphragm 45 will be moved to the left away from its seat permitting the solution to pass between the diaphragm and the sleeve 46 into the pipe 5.

It will be noted that as soon as the fluid reaches the right hand side of the diaphragm, the total pressure exerted at the right hand side becomes greater than the total pressure exerted at the left hand side of the diaphragm due to the difference in the exposed areas. Consequently, as the valve is further opened by moving the trigger 23 continually to the left, the pressure of the fluid actually assists in opening the valve until the latter reaches its maximum position, as determined by the adjustments obtained through the nut 34. Thus, the only time that considerable pressure must be exerted on the trigger 23 is when the diaphragm is breaking the seal—after that, the pressure of the fluid not only serves to open the valve still further, thus calling for less pressure at the trigger, but also maintains the valve in its fully opened position.

The spray gun can therefore be used for long periods of time without fatigue since little or no effort is required to hold the trigger against the handle 17 by compressing the grip.

It is apparent that the relative positions of the sleeve 36 and the cylinder 16 are so regulated that the valve closing effort of the spring 43 is only slightly in excess of the valve opening effort maintained by the pressure of the fluid so that this preponderation of effort is available to close the valve when the trigger 23 is released.

In the modified form of shut-off valve shown in Figures 8 and 9, the arrangement is such that as the handle 17 and trigger 23 are compressed in the hand, the trigger is forced toward the handle causing the spring 70 to be compressed. The spring forces the tail end 69 of the latch outwardly, and when the handle 17 is gripped with a strong enough force the surface 71 of the latch will contact the inside surface of the lug 24. This action will hold the trigger in its compressed position near the handle so that the gripping force can be released. Thus, the valve is maintained in an open condition after the trigger 23 has been once brought into contact with the handle 17 and then locked in this position by the latch 69. In order to release the trigger as described hereinbefore, it is only necessary to press the tail end 69 of the latch into its slot against the action of the spring 70 and this will cause the surface 71 to become disengaged from the lug 24.

Spray volume controlling mechanism at the nozzle end of gun

Within the head casting 8 and also extending within the pipe 7, there s a whirler mechanism comprising a cylindrical member 50 having a countersunk opening 51 at one end and terminating at the other end in a theraded extension 52. The cylinder 50 is provided with a plurality of angular slots which conveniently may be sawed into the wall of the cylinder.

The threaded end 52 of the member 50 is received in the right hand end of a vane-shaped member, the vanes of which there may be four, as indicated at 54, extending throughout most of the length of the member. The distance across each pair of oppositely disposed vanes is only slightly less than the internal diameter of the barrel 7, so that the vanes serve to center the cylinder 50 with respect to the bore 10. The left hand end of this member terminates in a flat portion indicated at 55, which is provided with a transversely extending slot. This slot receives a pin 57 extending upwardly, and integrally secured to a plate which forms a part of a cylindrical stem.

The plate rests on the upper surface of a hollow cylindrical member 60, which is closed at the lower end except for an opening through which the cylindrical stem extends. The cylinder 60 is provided with an outwardly extending flange and a threaded portion which is screwed into an internally threaded boss extending downwardly from the pipe or barrel 7.

There is a compression spring 64 loosely surrounding the stem and contained within the cylinder 60, this spring resting on a washer and some packing material. The lower end of the stem is received in an opening formed at the upper surface of a handle grip 66, the set screw 67 serving to secure the handle 66 to the stem. The handle is hollow, and the lower end is left open in order to drain off small amounts of fluid which might leak through the packing. It will be noted that the spring 64 bears downwardly against the packing, thus tending to maintain the packing in a tight condition and preventing any substantial amounts of fluid from passing through the handle.

In the normal operation of the spray gun the user will grip the handle 66 with his left hand and the combined trigger 23 and handle 17 with his right hand, directing the barrel at the position which it is desired to cover with the spray solution. The handle in the left hand can be turned to give the exact type of spray that is desired. It will be understood that the mist form of spray is desirable when the gun is placed close to the plant or tree being sprayed and wide coverage is desired, whereas the coarse or straight form of stream is desired when long throw is necessary, as when spraying the tops of trees.

In order to reduce the weight of the spray gun as much as possible, and to eliminate corrosion, it is desirable to make most of the parts of aluminum, by casting. Those parts which are subjected to the greatest wear, for example, the parts immediately surrounding the valve 45 and the spray adjusting mechanism are made of a harder metal, such as brass or bronze. It will be further evident that there are no welded joints within the gun and such few joints as are necessary are all of the screw type permitting a ready dis-assembly of the various parts for replacement and cleaning.

The combination of the pistol grip handle 17 and the position of the adjusting handle 66 affords a natural and easy position for the operator to hold the gun, at the same time giving the operator a firm grip on the gun against the recoil resulting from the discharge of the liquid at high pressures.

While I have explained the improved spray

gun from the standpoint of spraying plants, etc., it will be understood that the gun may be used for spraying other liquids on other surfaces, such as spraying cold water, paint, or distributing of etching acids over metal surfaces.

It will be understood that I desire to comprehend within my invention such modifications as may come within the claims and scope of my invention.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A hand-operated valve mechanism for controlling liquid passing through the barrel of a spray gun, said mechanism comprising a shield partially surrounding the barrel and adapted to move with respect thereto, a hollow handle secured to said barrel, said shield having sides which lie adjacent to said handle, said handle providing a passageway which communicates with the interior of said barrel, said passageway being normally closed by a valve, a trigger mounted on said barrel and adapted to move said shield longitudinally of the barrel when a gripping force is applied to the trigger, said shield being connected to said valve in order to open the passageway through the valve when the trigger is operated.

2. A hand-operated valve mechanism for controlling liquid passing through the barrel of a spray gun, said mechanism comprising a shield partially surrounding the barrel and adapted to move with respect thereto, a hollow handle secured to said barrel, said shield having sides which lie adjacent to said handle, said handle providing a passageway which communicates with the interior of said barrel, said passageway being normally closed by a valve, said barrel being closed at one end and a compression spring interposed between said closed end and said valve, means for adjusting the compressional effects of the spring, a trigger mounted on said barrel and adapted to move said shield longitudinally of the barrel when a gripping force is applied to the trigger, a rod connected between said shield and said valve whereby when the trigger is operated the valve is caused to move against the compressional effects of said spring to open the passageway between the handle and barrel.

3. A hand-operated valve mechanism for controlling liquid passing through the barrel of a spray gun, said mechanism comprising a shield partially surrounding the barrel and adapted to move with respect thereto, a hollow handle secured to said barrel, said shield having sides which lie adjacent to said handle, said handle providing a passageway which communicates with the interior of said barrel, said passageway being normally closed by a valve, said barrel being closed at one end by an adjustable cap member which contains a compression spring engaging said valve, a trigger mounted on said barrel and adapted to move said shield longitudinally of the barrel when a gripping force is applied to the trigger, said shield being connected to said valve in order to open the passageway between the handle and the barrel when the trigger is operated against the compressional effects of said spring, said adjustable cap member being adapted to control the force necessary to be applied to said trigger in order to operate the valve.

4. A hand-operated valve mechanism for controlling liquid passing through the barrel of a spray gun, said mechanism comprising a shield surrounding the barrel and adapted to move with respect thereto, said shield having a pair of slots at each end thereof, a hollow handle secured to said barrel and providing a passageway which communicates with the interior of the barrel, said passageway being normally closed by a valve, said barrel being closed at one end by a cap member which contains a spring for forcing the valve into said closed position, a trigger pivotally mounted on said barrel and provided with pins which extend into a pair of slots of said shield whereby the latter is caused to move longitudinally of the barrel when the trigger is operated, a housing surrounding said cap member and adapted to move with respect thereto, said housing being provided with pins which fit into one of the pairs of slots provided in said shield and a connecting rod extending between said housing and said valve through said cap member and spring whereby as the trigger is operated about its pivot the shield is moved with respect to the barrel, causing said housing also to move and to carry with it the connecting rod and valve in order to open the passageway between the handle and barrel.

5. A hand-operated valve mechanism for controlling liquid passing through the barrel of a spray gun, said mechanism comprising a shield surrounding the barrel and adapted to move with respect thereto, said shield having a pair of slots at each end thereof, a hollow handle secured to said barrel and providing a passageway which communicates with the interior of the barrel, said passageway being normally closed by a valve, said barrel being closed at one end by a cap member which contains a spring for forcing the valve into said closed position, a trigger pivotally mounted on said barrel and provided with pins which extend into a pair of slots of said shield whereby the latter is caused to move longitudinally of the barrel when the trigger is operated, a housing surrounding said cap member and adapted to move with respect thereto, said housing being provided with pins which fit into one of the pairs of slots provided in said shield and a connecting rod extending between said housing and said valve through said cap member and spring whereby as the trigger is operated about its pivot the shield is moved with respect to the barrel, causing said housing also to move and to carry with it the connecting rod and valve in order to open the passageway between the handle and barrel, said cap member being adjustably secured to said barrel in order to control the compressional effects of the spring and said connecting rod being adjustably secured to said housing in order to control the position of the trigger with respect to the handle.

WARREN M. SPRENG.