Oct. 6, 1959 A. H. PINKE 2,907,343

PRESSURE REGULATOR FOR COMPRESSION SPRAYER

Filed April 14, 1953

Fig. 1.

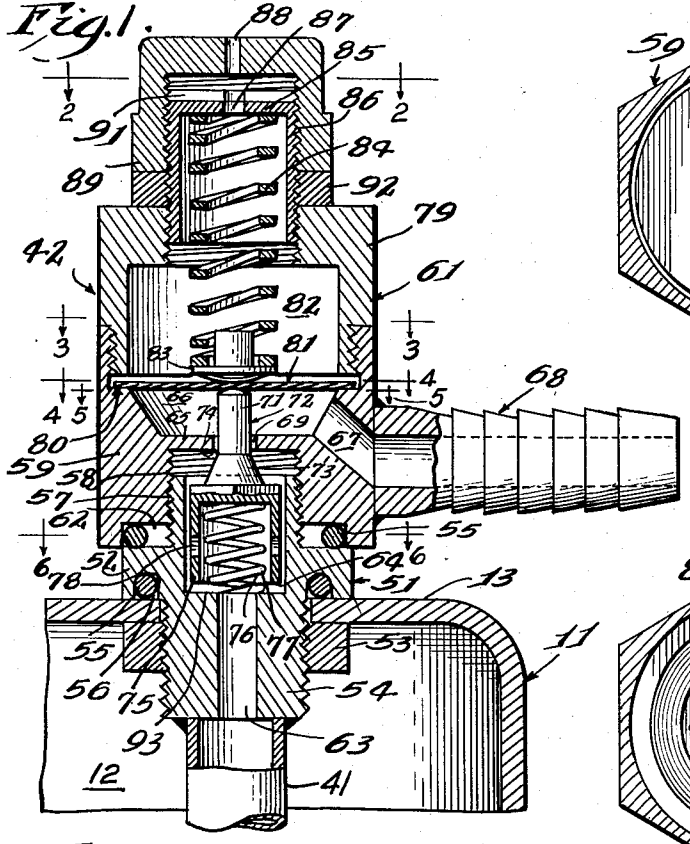


Fig. 4

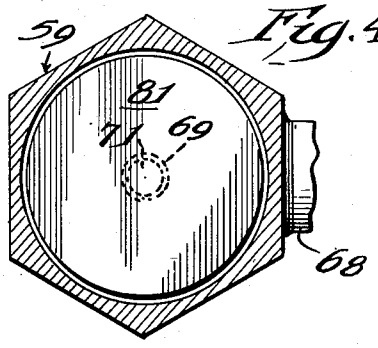


Fig. 5

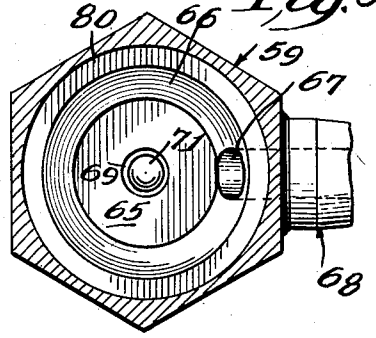


Fig. 2.

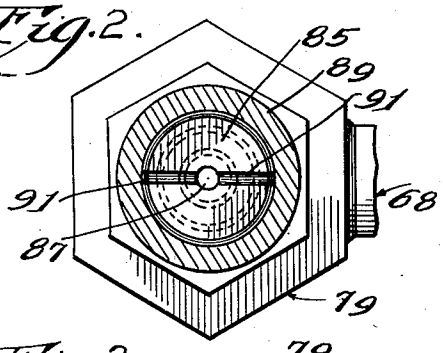


Fig. 6.

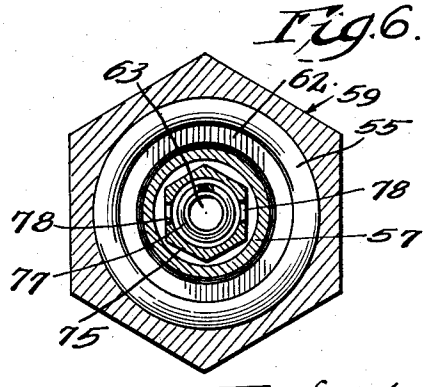
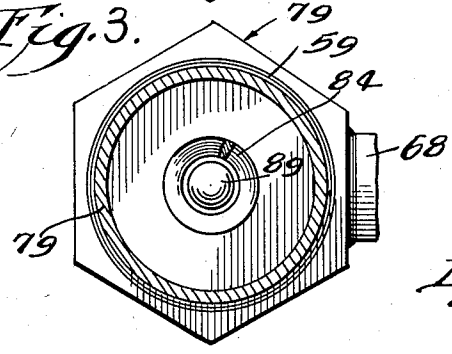


Fig. 3.



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PRESSURE REGULATOR FOR COMPRESSION SPRAYER

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Application April 14, 1953, Serial No. 348,638

1 Claim. (Cl. 137—505.42)

The present invention relates to novel means and mechanism for regulating the discharge pressure in compression sprayers.

In the operation of compression sprayers, a pump is provided for supplying air under pressure to the tank containing the liquid or spray solution to be dispensed, and as the pump plunger and its associated parts move downward in the pump cylinder, air entering the cylinder is compressed and discharged through a pump valve into the interior of the tank and therein builds up sufficient pressure to effect discharge and dispensing of the liquid or spray solution from the tank through a suitable control valve and nozzle.

Such compression sprayers of the type disclosed are adapted for spraying insecticides, pesticides, agricultural as well as commercial and industrial chemicals, calcimine, whitewash, cold water paints or other sprayable solutions. By building up air pressure in the tank or pressure-type vessel by manipulation of the pump, spraying may continue until the pressure decreases to such a degree that effective spraying is no longer possible, whereupon the operator closes the valve and again manipulates the pump to build up sufficient pressure to permit continuing the spraying operation. Spraying apparatus of this general type is disclosed in the Winks and Fletcher Patent No. 2,529,645, granted November 14, 1950, although it is to be understood that the present invention is not limited thereto but is adapted for use with various forms of compression sprayers operating on this principle.

One of the objections to the above mentioned type of compression sprayers is that the pressure for effecting discharge of the spraying solution cannot be regulated or controlled and maintained uniform throughout the spraying operation. As the pressure decreases, the volume and pattern of the discharged spray is altered to such an extent that most effective and uniform spraying cannot be accomplished. More specifically, with the control valve closed, manipulation of the pump by the operator builds up a substantial pressure in the tank or container to effect dispensing of the liquid. However, spraying is effective at such pressure only so long as such pressure can be maintained in the tank, and as the spraying operation continues the pressure in the tank gradually lowers and continues to decrease with the resulting spray pattern and droplet size being substantially altered.

Among the objects of the present invention is the provision in the discharge line of the compression sprayer of novel means and mechanism for regulating and controlling the discharge pressure whereby to assure uniformity of spray droplet size and spray pattern issuing from the spray nozzle.

A further object of the present invention is to provide a novel means for and manner of controlling the effective pressure at which the spraying continues until such time as the operator is again required to manipulate the pump. In other words, maximum pressure is created in the pressure tank by operation of the pump, after which

spraying at a desired or predetermined pressure and less than that created may be continued for a substantial period of time or until the pressure decreases below a predetermined amount. During this period of spraying the operator is assured of dispensing a uniform volume and spray pattern.

The present invention further comprehends the provision of a novel pressure regulator for compression sprayers adapted to be inserted in the exhaust or discharge line of the sprayer whereby to assure discharge of the spraying solution at a uniform pressure during the spraying operation.

A further object of the present invention is the provision of a novel pressure regulator for accurately controlling the pressure at which the spraying solution of a compression sprayer is discharged. In its preferred embodiment the regulator is adjusted for operation at a prescribed or predetermined pressure so as to assure discharge of the spraying solution at a pressure that will assure optimum effectiveness.

Further objects are to provide a construction of maximum simplicity, efficiency, economy and ease of assembly and operation, and such further objects, advantages and capabilities as will later more fully appear and are inherently possessed thereby.

In the drawings:

Fig. 1 is an enlarged view in vertical cross section through the novel means for regulating or controlling the discharge pressure.

Fig. 2 is a view in horizontal cross section taken in a plane represented by the line 2—2 of Fig. 1 and viewed in the direction of the arrows.

Fig. 3 is a view in horizontal cross section taken in a plane represented by the line 3—3 of Fig. 1 and viewed in the direction of the arrows.

Fig. 4 is a view in horizontal cross section taken in a plane represented by the line 4—4 of Fig. 1 and viewed in the direction of the arrows.

Fig. 5 is a view in horizontal cross section taken in a plane represented by the line 5—5 of Fig. 1 and viewed in the direction of the arrows.

Fig. 6 is a view in horizontal cross section taken in a plane represented by the line 6—6 of Fig. 1 and viewed in the direction of the arrows.

Referring to the disclosure in the drawings and more particularly to the selected illustrative embodiment, the compression sprayer to which the present invention is shown applied, comprises a tank or liquid container **11** adapted to receive within its hollow interior **12** a substantial quantity of a liquid such as an insecticide, solvent, paint or other chemical preparation or sprayable solution. Pressure is generated in the tank by means of a pump to effect discharge of the spray solution in the manner shown in the Winks et al. Patent No. 2,529,645, of November 14, 1950. This pressure generated in the tank **11** is then utilized to dispense liquid from the tank through a discharge tube **41** depending in the tank **11**. To the outer projecting end of this tube **41** is connected the novel means **42** for regulating or controlling the discharge pressure issuing to a flexible hose carrying the usual spray nozzle at one end and a manually actuated control valve, not shown.

In Figs. 1 to 6, inclusive, is disclosed the novel means or mechanism **42** for regulating or controlling the discharge pressure from the tank **11**. It comprises a threaded connector **51** affixed to the top wall **13** of the tank by an integral enlargement **52** preferably of external polygonal shape and a lock nut **53** threaded onto the depending threaded reduction **54** for drawing this enlargement down onto the top wall **13**. An O ring or

resilient gasket 55 disposed in a downwardly opening, annular channel 56 provides for effective sealing thereat.

The upper threaded reduction 57 of the connector is adapted to be received in the lower threaded opening 58 in a lower section or part 59 of a two-part, detachable body or housing 61. An O ring or annular gasket 55 received in a recess 62 in the lower section or part 59 provides effective sealing between the enlargement 52 and this lower section. The connector 51 is provided with a bore or passage 63 which opens into an enlarged recess formed or provided in the upper reduction 57 thereof and into the interior of the lower body section or part 59 where it provides a chamber 64. This chamber 64 is separated by a transverse wall 65 in the body section or part 59 from a chamber 66 formed or provided in the upper portion of this body section or part connected or opening into a port 67 and the passage in a discharge duct 68 to which one end of the flexible discharge hose 43 is connected.

An aperture 69 in the transverse wall 65 permits restricted flow from the chamber 64 to the chamber 66 about an upstanding pin 71 of a valve member 72 spring-biased toward its raised or elevated position. The pin 71 of the valve member is loosely received and vertically movable in the aperture 69 and beneath the pin the valve member is provided with a machined, outwardly flared or conical seat 73 having a maximum diameter or cross section greater than that of the aperture 69 and adapted to seat against a valve seat 74 formed by the material defining or encompassing the aperture in the transverse wall. The length of the pin 71 and seat 73 is determined by the depth of the chamber 66.

The pin 71 and machined seat 73 are formed integral with or connected to a depending hollow base 75 (Fig. 1) the exterior of which is of polygonal or hexagonal shape (Fig. 6), the hollow interior or cup-shaped recess 76 thereof being adapted to receive the upper end of a coil or expansible spring 77 seating at its other end against the base of the recess or chamber 64, which spring-biases the pin 71 and seat 73 of the valve member 72 to elevated position. As shown in Figs. 1 and 6, the hollow depending base 75 is provided with a pair of opposed ports 78 for the passage therethrough of the liquid in the tank 11.

The upper section or part 79 of the two-part body or housing 61 is detachably or threadedly mounted in the lower section or part 59 with a relatively thin and flexible metal diaphragm 81 located on a shoulder 80 in the lower section or part and disposed between this shoulder and the depending end of the upper part 79 of the housing and separating the chamber 66 therebelow from the chamber 82 in the hollow of the upper section or part 79. Bearing and held down against the upper surface of this diaphragm is a button or plug 83 by means of a relatively heavy coil or expansible spring 84, the upper or other end of this spring bearing or seating against the upper or outer end wall 85 of a threaded cup-shaped member 86 longitudinally adjustable in the upper housing section or body part 79.

The end wall 85 of the member 86 is provided with a relief port 87 and a communicating relatively small relief port 88 is provided within threaded end cap 89 for venting the chamber 82 to the atmosphere. The end wall 85 is also transversely slotted at 91 (Fig. 2) for receiving a screw driver or similar instrument for adjusting the cup-shaped member 86 and thereby adjusting the compression on the coil spring 84. A lock nut 92 locks this cup-shaped member 86 in predetermined adjusted position.

It will be seen from the above description and the disclosure in Figs. 1 to 6, inclusive, that the novel means for regulating or controlling the discharge pressure in a compression sprayer is mounted in the discharge line and consists of three chambers, one chamber 82 being above the diaphragm 81 and two chambers 64 and 66 being located below the diaphragm. The upper chamber 82 houses the relatively heavy coil spring 84 placing the desired or predetermined pressure upon the diaphragm 81. The chamber 66 opens into the port 67 communicating with the discharge line.

In the lower chamber 64 is mounted the cup or base 75 of the valve member 72 which by reason of its polygonal contour is longitudinally spaced from the inner cylindrical wall of the threaded connector 51. By providing the wall of the cup or hollow base 75 with ports 78, liquid or spraying solution is permitted to flow from the interior of the cup upwardly between its exterior or periphery and the interior cylindrical wall of the connector 51 into the chamber 64 above the cup or base 75. By the disclosed arrangement, the seat 73 of the valve member 72 is spring-biased toward closed position and the pin 71 thereof against the underside of the diaphragm 81 by the spring 77.

The pin 71, seat 73 and valve member 72 have a predetermined length whereby the lower end of the cup or base 75 is adapted to seat against the shoulder 93 (Fig. 1) or bottom of the lower chamber 64 and thus prevents the diaphragm 81 from being unduly distorted downwardly should the downward thrust and the pressure in the upper chamber 82 on the diaphragm exceed the pressure of the spring 77 in the lower chamber. Likewise, should the pressure in the lower chamber 64 exceed the pressure in the upper chamber, the effective length of the pin 71 and the seat 73 is such as to limit the upward thrust and upward distortion on the diaphragm.

For example, if the pressure on the liquid or spraying solution in the tank 11 built up by the pump is approximately 50 p.s.i. and the pressure on the diaphragm 81 as exerted by the spring 84 in the upper chamber 82 is adjusted to approximately 20 p.s.i., and the pressure in the discharge line becomes less than approximately 20 p.s.i., the diaphragm 81 is pushed down which in turn pushes the pin 71 downwardly, thus opening the port 69 between the lower and upper chambers 64 and 66 below the diaphragm 81 and permitting liquid under pressure to increase to approximately 20 p.s.i. Such increase in pressure raises the diaphragm 81 and consequently the pin 71, closing the port 69 to any pressure entering the discharge line greater than approximately 20 p.s.i.

In prior constructions, a compression sprayer when pumped to 50 p.s.i. would initially emit liquid or spray at that pressure, i.e. at the pressure in the tank, and as that pressure dropped the pressure in the discharge line necessarily dropped, all of which varied the spray droplet size, the spray pattern and the efficiency of the spraying operation. In the present novel device, by controlling the discharge pressure to a determined maximum amount, a constant spray pattern is presented over an extended period of time.

From the above description and the disclosure in the drawings, it will be apparent that the present invention comprehends the provision of a novel means for and manner of automatically preventing the development in a compression sprayer tank of air pressure in excess of that required or desired and for regulating the discharge pressure. In fact, by means of the present invention a compression tank need not be undercharged for the reason that the operator being warned of the fact that the maximum desired air pressure has been reached, has no excuse for undercharging the tank with air. This protection is accomplished without the necessity of any pressure gauge or other pressure indicating means. And by regulating the discharge pressure, the operator is assured of a uniform spray pattern and maximum efficiency.

Having thus disclosed the invention, I claim:

Pressure regulating means for controlling the pressure at which liquid under pressure is dispensed from a container, comprising a connector having a part provided with an inlet port and an exterior part for the passage of the liquid under pressure, a two-part housing detachably mounted on the exterior part of the connector, the lower

part of said housing having a discharge passage and a transverse wall dividing said lower part into spaced chambers with said wall provided with a single port for connecting these chambers, the upper part of the housing also having a chamber and an internally threaded bore at its upper end, an imperforate thin metal diaphragm positioned between said parts of the housing and dividing the chamber in the upper part of the housing from the chambers in the lower part, a cup member anchored in adjusted position in the bore in the upper part of the housing, a compression spring in the upper part of the housing having one end received in and seating against the end of said cup member and the other end exerting pressure against the central portion of the upper face of the diaphragm, means for adjusting said cup member to adjust the compression on the spring, an end cap enclosing and protecting said cup member when the latter is anchored in adjusted position, a relief port in said end cap and in said cup member for venting the upper chamber, a valve member in the lower part of the housing having a projection extending loosely through the port in the transverse wall and bearing against the underside of the diaphragm, a tapered valve seat in the chamber beneath the transverse wall having seating engagement with the transverse wall to control flow through its port and a hollow, downwardly opening base depending from the tapered valve seat into an enlarged bore in the exterior part of the connector with said connector provided with a shoulder against which said hollow base is adapted to

abut when the valve member is fully open, and means in said hollow base for spring-biasing the valve member toward elevated position to maintain said projection in contact with the diaphragm, said hollow base having one or more apertures in its periphery whereby the liquid under pressure enters the connector and flows into the hollow base, outwardly through said apertures and between the exterior of said base and the spaced, encompassing wall of the housing, then through the port in the transverse wall and into the chamber open to the discharge passage, said valve member being of such length that the distortion of the diaphragm by downward thrust is limited by contact of the hollow base of said valve member on said shoulder.

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