

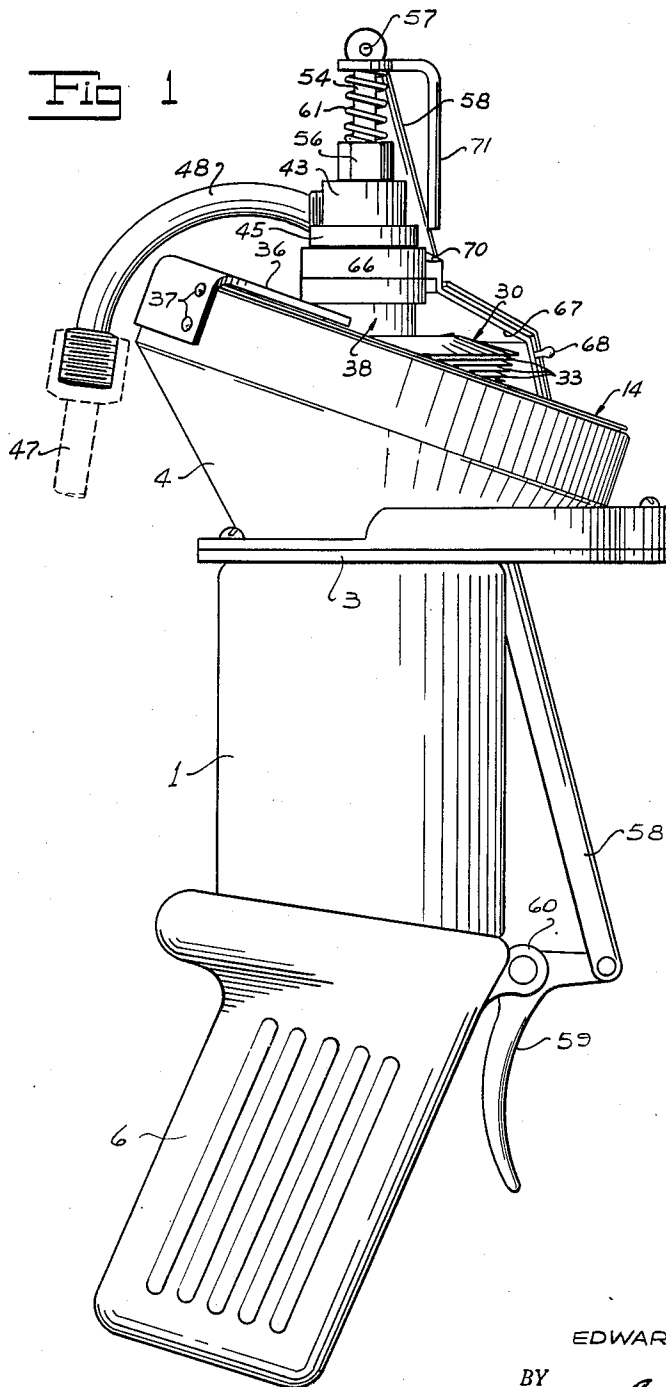
March 20, 1951

E. O. NORRIS
SPRAYING DEVICE

2,545,489

Filed March 29, 1946

3 Sheets-Sheet 1.



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3 Sheets-Sheet 2

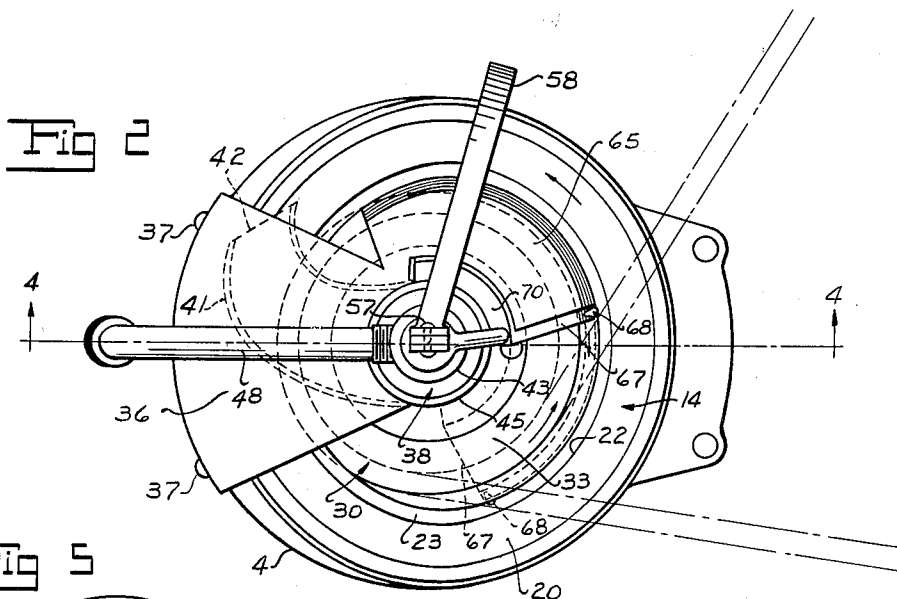
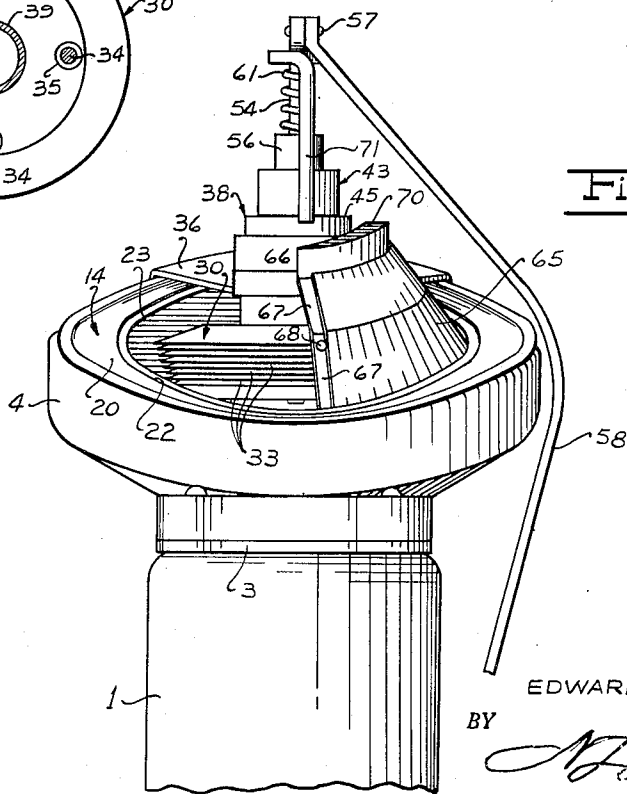
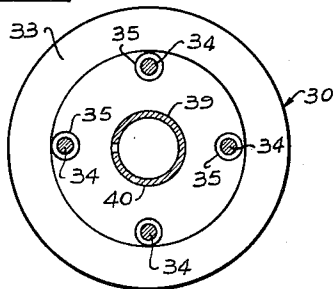


Fig 5



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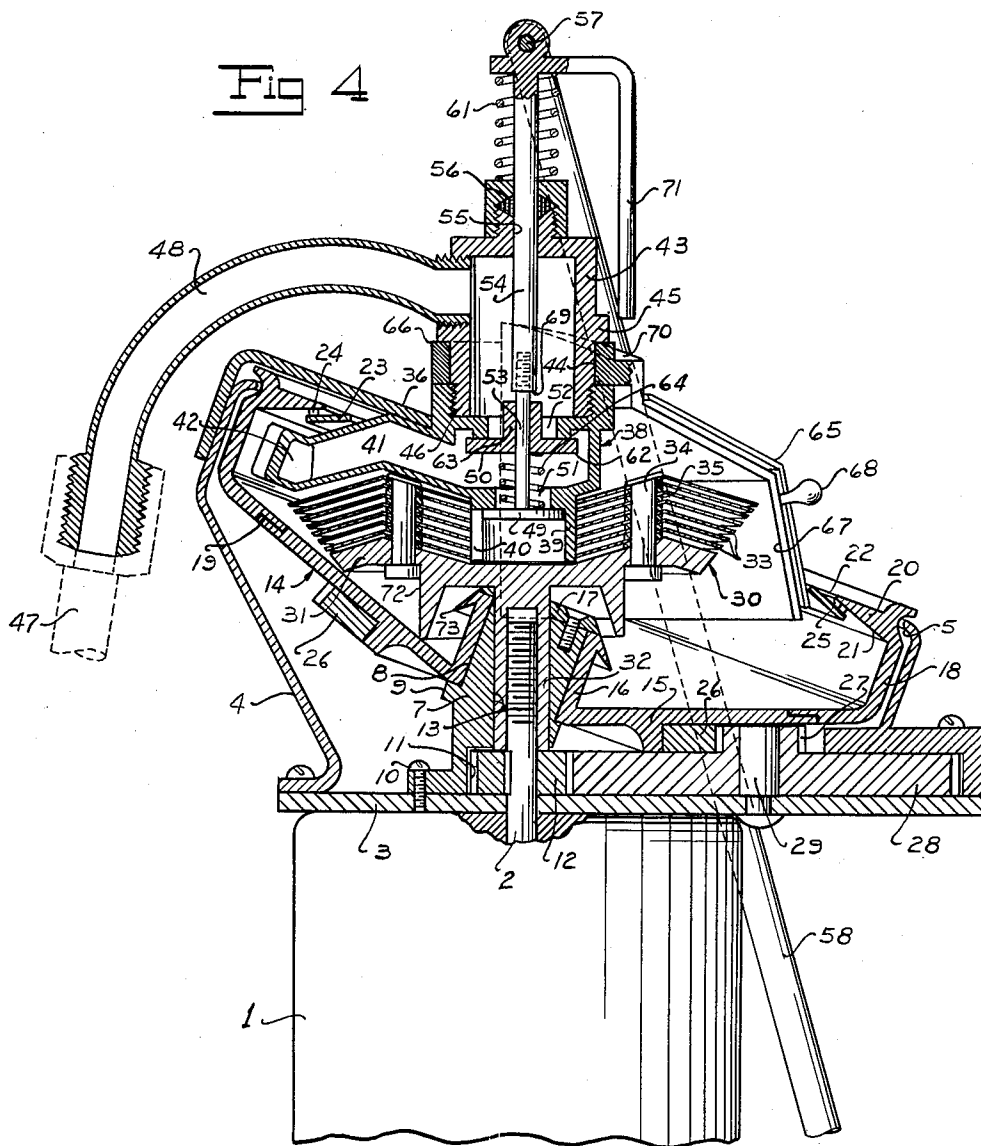
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3 Sheets-Sheet 3



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SPRAYING DEVICE

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7 Claims. (Cl. 299—63)

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This invention relates generally to spraying apparatus of the centrifugal type wherein a liquid is fed by suitable means to an atomizing distributor, rotating at high speed, which receives, atomizes, and projects the liquid in a finely divided spray, through a suitable opening in the apparatus, against the surface to be sprayed.

The apparatus disclosed in this application is an improvement of the spraying device disclosed in my Patent No. 2,063,048 issued December 8, 1936. This application is directed to the means for supplying and controlling the feed of liquid to the distributor, the general object of the invention being to provide a device of this character which is simple, compact, light and efficient in operation, and which is especially adapted for use by relatively unskilled operators.

Another object of the invention is to provide in a device of this character improved means for supplying the liquid to the rotating distributor.

Another object of the invention is to provide, in a device of this character, means which automatically control the amount of liquid supplied to the distributor in such a manner that the amount supplied is proportional to the extent of the band of liquid being sprayed upon an object.

Another object of the invention is to construct and arrange the various parts of the device in such a manner that I am enabled to use a rotating distributor having a greater number of plates and thus increase the thickness of the band of atomized liquid being sprayed.

Other and more limited objects of the invention will be apparent from the following specification and the accompanying drawings forming a part thereof wherein:

Fig. 1 is a side elevation of a centrifugal spraying device constructed according to my invention;

Fig. 2 is a top plan view thereof;

Fig. 3 is a front elevation of the upper portion thereof;

Fig. 4 is an enlarged central vertical section taken on the line 4—4 of Fig. 2; and

Fig. 5 is a horizontal section through the rotating atomizing distributor.

My improved spraying apparatus comprises generally a rotating atomizing distributor and an open-ended rotating collecting case with the axis thereof disposed at an angle to the axis of the distributor. The distributor is so positioned within the collecting case that a portion of the liquid which is atomized and sprayed outwardly therefrom will be projected through the open end of the case and the balance of the spray will

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be intercepted by the case and returned to the distributor for re-spraying. A gate, by which the width of the band of atomized spray projected out through the open end of the collecting case may be varied, is suitably mounted within the open end of the collecting case. A trigger-operated valve mechanism is provided for controlling the admission of liquid to the distributor, and there are cooperating means between the gate and the valve mechanism, which make the extent the valve mechanism can be opened to admit liquid to the distributor dependent upon the position of the gate. The collecting case is mounted within a housing which is secured to the upper end of the case of a high speed series type motor which drives the distributor and collecting case. A suitable handle by which the apparatus is held and manipulated in operation is secured to the lower end of the motor case.

Referring now to the drawings by reference characters, the numeral 1 indicates a case in which is mounted a high speed series type motor having an armature shaft 2. A plate 3, to which is removably secured a housing 4 having an open end 5, is fastened in any suitable manner to the upper end of the motor case 1. A handle 6, by which the device is held and manipulated in operation, is secured to the lower end of the motor case 1.

A support 7 having a cylindrical portion 8 with an annular flange 9 about the lower end thereof is fastened to the plate 3 by screws 10, with the axis of the cylindrical portion 8 disposed at an angle to the axis of the armature shaft 2. The lower end of the support 7 is recessed as indicated at 11 to accommodate a small pinion gear 12 which is suitably secured to the armature shaft 2. A cylindrical bore 13 extends upwardly from the recess 11 through the support 7 with the axis thereof in alignment with the axis of the armature shaft 2.

A collecting case 14 having a frusto-conical base 15 and a hub 16 is rotatably supported by the cylindrical portion 8 of the support 7 within the housing 4, and is held in place thereon by a cap 17. The case 14 is made in two parts, the base 15 and the cylindrical body portion 18, which are joined together as indicated at 19. The upper end of the body 18 of the case terminates in an inwardly extending annular flange 20 which has a frusto-conical inner surface 21, and a concentric circular opening 22 therethrough. A frusto-conical ring 23 is secured to the inner surface 21 of the flange 20 within the case 14 by lugs 24. The ring 23 is disposed inwardly of the flange 20; a

short distance to provide an annular space 25 and is mounted concentrically with the opening 22. A gear 26, which is secured to the under surface of the base 15, of the case 14, concentrically with the hub 16, meshes with a small pinion 27 which is formed integrally with, or is rigidly secured to a larger gear 28 which, in turn, meshes with the pinion gear 12 on the armature shaft 2. The gears 27 and 28 are rotatably mounted upon a stud 29 projecting upwardly from the plate 3. The case 14 is rotated in a counterclockwise direction, as viewed in Fig. 2, through this gear train at about 1200 revolutions per minute.

A rotating atomizing distributor 30, which receives and atomizes a liquid, and projects a band of spray out through the ring 23 is mounted partially within the case 14 in axial alignment with the armature shaft 2. The distributor 30 includes a base 31 having a downwardly extending sleeve 32 which is rotatably supported in the cylindrical bore 13 in the support 7. The sleeve 32 which is interiorly threaded is screwed onto the upper threaded end of the armature shaft 2 as shown, so that the distributor will rotate with the armature shaft at about 12,000 revolutions per minute. A plurality of ring-shaped discs 33 are secured to the base 31 in spaced relation to each other by rivets 34 and spacers 35.

A bracket 36 which is fastened to the housing 4 by screws 37 supports a valve body 38 in axial alignment with the distributor 30 and armature shaft 2. The lower reduced end 39 of the valve body 38 extends down through the centrally disposed aligned opening in the discs 33, and has a vertically extending slot 40 through the wall thereof. A hollow scoop 41 having its open end 42 disposed closely adjacent the annular wall of the case body 18 is formed integrally with the valve body 38 with the interior of the scoop being in communication with the interior of the valve body 38 above the reduced lower end 39 thereof. A sleeve 43 having a cylindrical bearing surface 44 between an annular flange 45 and the threaded lower end 46 thereof is screwed into the upper open end of the valve body 38. Liquid is forced from any suitable source of supply into the interior of the sleeve 43 through a flexible conduit 47 and a coupling 48 secured to the sleeve 43. The flow of liquid from the sleeve 43 to the distributor 30 is controlled by valves 49 and 50 which are adapted to open or close ports 51 and 52 as desired. The valve 49 in the form of a flat disc is rigidly secured to the reduced lower end 53 of a valve stem and is disposed beneath the port 51 within the reduced lower end 39 of the valve casing 38. The enlarged upper end 54 of the valve stem is slidably mounted in and extends out through a suitable bore 55 in the upper end of the sleeve 43. A packing 56 prevents the leakage of liquid around the valve stem. The upper projecting end of the valve stem is pivotally connected at 57 to the upper end of link 58 which is connected at its lower end to a bell crank trigger 59 pivotally connected to a bracket 60 on the handle 6. A spring 61 about the projecting end of the valve stem normally holds the valve 49 in position to close the port 51, as shown in Fig. 4. The valve 50 in the form of a flat disc 62 having a hub 63 is slidably mounted on the reduced lower end 53 of the valve stem, between the ports 51 and 52, and is normally held in position to close the port 52 by a coiled spring 64.

An arcuate shield 65 which is rigidly secured to the bracket 36 partially closes the opening through the frusto-conical ring 23. This shield

extends from a point approximately opposite the lowest point in the plane of the opening 22 of the case 14 around in one direction to a point slightly beyond the point where the plane of the periphery of the uppermost disc 33 intersects the plane of the opening 22 of the case 14 at the trailing edge of the opening i. e. the edge toward which the distributor rotates, with the lower edge of the shield disposed within the case 14 throughout the entire extent of the shield.

A hub 66 is rotatably mounted upon the bearing surface 44 of the sleeve 43 between the upper end of the valve body 38 and the annular flange 45. The hub 66 has the upper inner edge of an arcuate gate 67 secured thereto. The gate 67 is disposed within the shield 65 and is adapted to be rotated by a knob 68, out from beneath the shield 65 to further close the opening through the ring 23 as desired. This gate constitutes in effect an adjustable extension of the shield 65 and serves to regulate the width of the band of spray projected by the distributor 30. When the gate is fully extended, as shown in dotted lines in Fig. 2, the opening through which the spray is projected is entirely closed.

Operation

In operation the operator holds and manipulates the device by the handle 6. The motor is energized through a suitable switch, not shown, which rotates the collecting case 14 and the distributor 30 in a counterclockwise direction. The collecting case is rotated at approximately 1200 revolutions per minute and the distributor is rotated at approximately 12,000 revolutions per minute, or ten times as fast as the collecting case. The operator then moves the downwardly extending arm of the trigger 59 towards the handle 6 which through the link 58 moves the valve stem and the valves 49 and 50 downwardly in the valve body 38 opening the passageways 51 and 52. During the initial movement of the valve stem the valve 49 only is moved. The valve 50 is not moved to open the passageway 52 until the shoulder 69 between the lower and upper sections 53 and 54 of the valve stem engages the hub 63 of the valve 50. Liquid will then flow from the sleeve 43 into the reduced lower end 39 of the valve body 38 and then out through the slot 40 onto the upper surfaces of the atomizing distributor discs 33. The discs 33, due to their high speed rotation, will atomize the liquid and project a ring of finely atomized spray outwardly from the periphery thereof. Part of this ring of spray will be projected out through the opening in the ring 23 and the balance thereof will be caught and collected by the case 14. The spray caught by the rotating case 14 will be thrown out against the inner peripheral wall of the case and form a ring or annular band of liquid therearound into which the open end 42 of the scoop 41 projects. The rotation of the case will force this collected ring of liquid into the scoop 41 and through the open end 42 thereof, which will return it to the valve body for re-spraying. The delayed opening of the valve 50 assures an accurate control of the liquid being supplied to the distributor, admitting only a small amount of liquid from the supply which is added to and mixed with the return liquid collected by the case 14. It will thus be apparent that the valve 49 controls the flow of this combined supply of liquid, whereas the valve 50 controls only the flow of liquid which is taken directly from the source of supply and added to the return liquid

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which has been sprayed into and collected by the case 14 for re-spraying.

The width of the band of spray projected out through the ring 23 towards an object to be sprayed is dependent upon the position of the gate 67, the further the gate is withdrawn from the shield 65, the narrower the band of projected spray and the greater the amount of spray collected by the case and returned to the distributor for re-spraying. As the width of the projected band of spray is decreased, the amount of liquid supplied to the distributor should be proportionately decreased. Accordingly, I have provided cooperating means between the gate and the valve operating mechanism which automatically limits the maximum amount of liquid that can be supplied to the distributor for any position of the gate 67.

This means comprises a helical cam surface 70 which is secured to and movable with the hub 66 of the gate 67, and a depending cooperating finger 71 which is secured to and projects downwardly from the upper end of the valve stem towards the cam surface 70. The distance between the lower end of the finger 71 and the cam surface 70 determines the amount the valve stem may be depressed to open the valves 49 and 50; the greater this distance, the more the valves 49 and 50 can be opened and consequently the greater the amount of liquid that is supplied to the distributor 30. As the gate 67 is adjusted to decrease the width of the band of projected spray, the distance between the lower end of the finger 71 and the cam surface 70 is proportionately decreased which proportionately decreases the maximum amount of liquid that can be supplied to the distributor 30.

The frusto-conical ring 23 is provided to return any intercepted spray to the case 14 and to prevent globules of liquid from being thrown out from the case 14.

Annular flanges 72 and 73 on the distributor base 15 and case hub 16 respectively prevent liquid from working into the bearing 13 about the sleeve 32 of the distributor.

It is to be understood that the apparatus is particularly adapted to paint spraying although the apparatus can be used equally well for atomizing and spraying other liquid, such as a liquid disinfectant.

The invention is not to be limited to the specific construction shown and described herein as various modifications can be made therein within the scope of the appended claims.

What is claimed is:

1. In a portable spraying device, the combination of a centrifugal atomizing distributor having means to receive and atomize liquid and spray a ring of atomized liquid outwardly from the periphery thereof, a rotary collecting case having an axis disposed at an angle to the axis of said distributor, said collecting case having an axially disposed opening and being so positioned with respect to said distributor that a portion of said ring of spray will be projected out through said opening and the balance of said ring of spray will be intercepted and collected by said case, and means for controlling the supply of liquid to said distributor, said last mentioned means comprising a valve body operatively associated with said distributor in axial alignment therewith, said valve body having a chamber therein and having, a port through which liquid flows from a source of supply into said chamber, a valve operable to control the flow of liquid through said port, means

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through which the liquid collected in said case is returned to said chamber where it mixes with the liquid flowing into said chamber from the source of supply, said valve body having a second port communicating between said chamber and said distributor, a second valve arranged to control the flow of liquid through said second port, and valve operating means connected to open and close said valves, said valve operating means being operable to open said second valve in advance of the opening of said first mentioned valve.

2. In a portable spraying device, the combination of a motor case having a high speed motor enclosed therein, a housing rigidly secured to said motor case, a rotary collecting case partially enclosed by said housing with the axis thereof disposed at an angle to the axis of said motor, a centrifugal distributor partially enclosed by said collecting case with the axis thereof disposed in axial alignment with the axis of said motor, driving connections between said motor and said collecting case and said distributor within said housing through which said collecting case and said distributor are rotated in the same direction at different speeds, an axially disposed opening in said collecting case, said collecting case and said distributor being so arranged with respect to each other that a portion of the liquid sprayed radially outward by said distributor will be projected out through said opening and the balance of said liquid will be intercepted and collected by said collecting case, means for returning said intercepted liquid to said distributor for re-spraying, means for supplying additional liquid directly from a source of supply to said distributor, manual control means to control the flow of said liquid to said distributor, an adjustable gate for varying the width of the band of liquid projected out through said opening, a stop member on said manual control means, and stop means actuated by said gate to engage said stop member to limit the movement of said manual control means so that the maximum amount of liquid supplied to said distributor corresponds to the capacity of the spray opening.

3. In a spraying device, a centrifugal distributor having means to spray a ring of atomized liquid outwardly from the periphery thereof, a collecting case having a spray opening, said case being so positioned with respect to said distributor that a portion of said ring of spray will be projected out through said opening and the balance of said ring of spray will be intercepted by said case, means in said case to return the intercepted liquid to said distributor for re-spraying, means for feeding additional liquid to said distributor for spraying, valve means to control the flow of said liquid to said distributor, a stop member on said valve means, stop means engaging said member to limit the maximum opening of said valve means, adjustable means operable to vary the area of said spray opening, said stop means being actuated by said last means and being arranged to limit the maximum amount of liquid supplied to said distributor to the capacity of the adjusted area.

4. A spraying device as set forth in claim 3 in which the adjustable means comprises a shiftable gate disposed to vary the width of the spray opening and the stop means is variably positioned by said gate.

5. A spraying device as set forth in claim 4 in which manual means is provided to open said valve means and the stop means comprises a cam

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positioned by said gate to limit the opening of said valve means.

6. A spraying device as set forth in claim 3 in which said valve means includes a return valve and a feed valve connected to control respectively the return of said intercepted liquid and the feed of said additional liquid to said distributor, and manual means is provided to actuate said valves, said manual means being connected to open said return valve prior to said feed valve.

7. In a portable spraying device, the combination of a centrifugal atomizing distributor having means to receive and atomize liquid and spray a ring of atomized liquid outwardly from the periphery thereof, a rotary collecting case having an axis disposed at an angle to the axis of said distributor, said collecting case having an axially disposed opening and being so positioned with respect to said distributor that a portion of said ring of spray will be projected out through said opening and the balance of said ring of spray will be intercepted and collected by said case, means for returning said intercepted liquid to said distributor for re-spraying, and a stationary shield disposed in the path of the spray projected through said opening, said shield extending around a portion of the periphery of said dis-

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tributor from the trailing edge of the opening in the direction of rotation of said distributor where the plane of the distributor intersects the plane of the opening, to a point in advance thereof in the direction of rotation of the distributor, the lower edge of said shield being disposed within the confines of said case throughout the entire extent of the shield.

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