United States Patent

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[54] **ADJUSTABLE TURRET SPRAY NOZZLE**
5 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** **239/394**
[51] **Int. Cl.** **A62c 31/02**
[50] **Field of Search** 239/394, 487, 395, 396

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ABSTRACT: A spray nozzle employed as a part of the crop-spraying system employed on a crop-spraying aircraft incorporating a rotatable plate having a plurality of orifices therein of different size for alignment with a discharge passage with the plate including one portion thereof which is imperforate to render the nozzle inoperative when desired. The structure for adjustably locking the nozzle plate in position includes a structure for causing the material discharged through the orifice to be discharged in a swirling pattern to provide efficient spraying of the material.

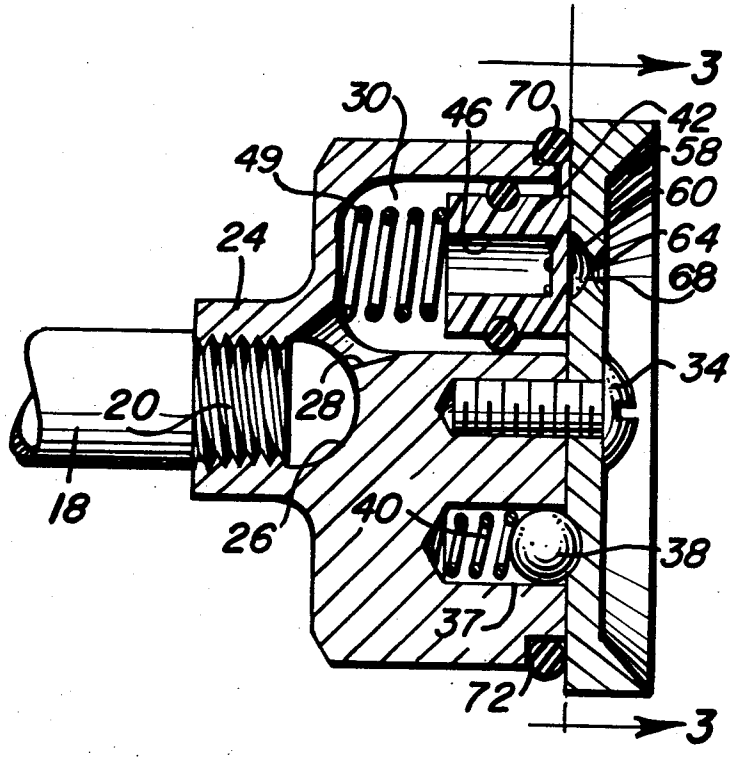


Fig . 1

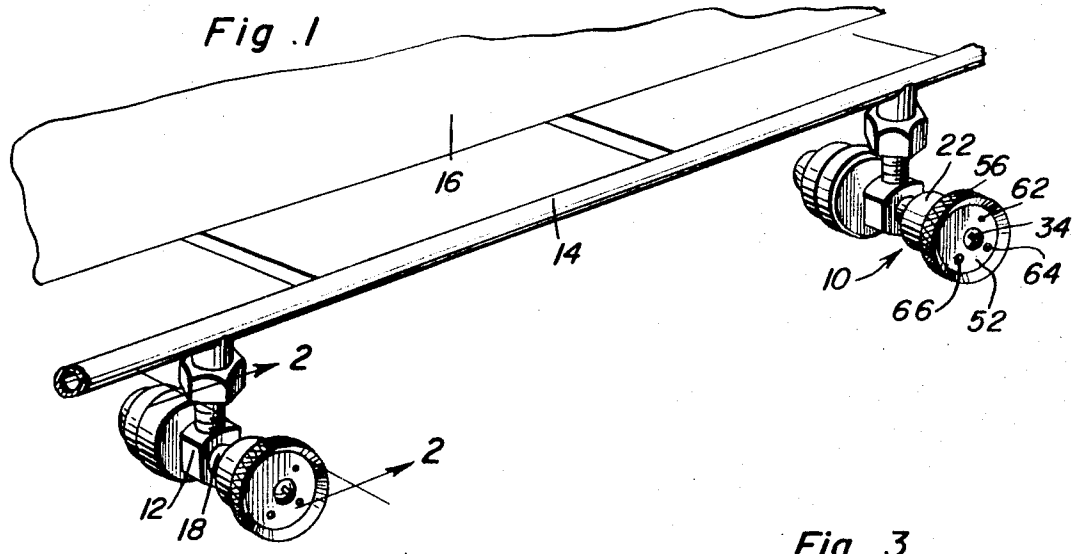


Fig . 2

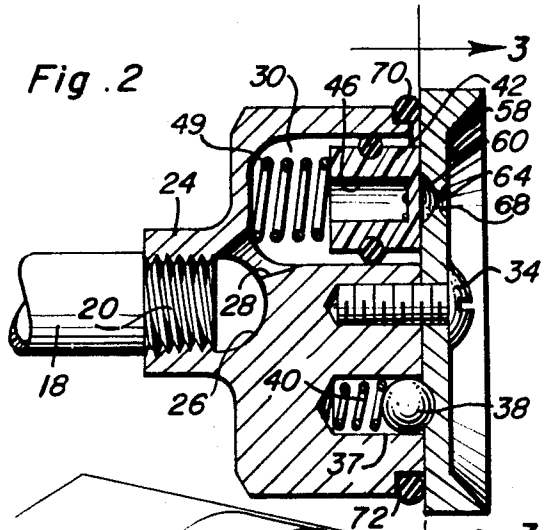
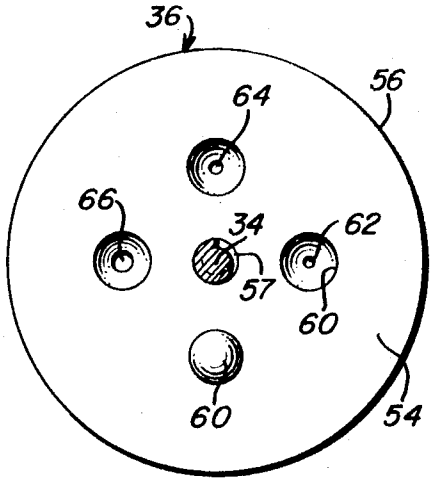


Fig . 3



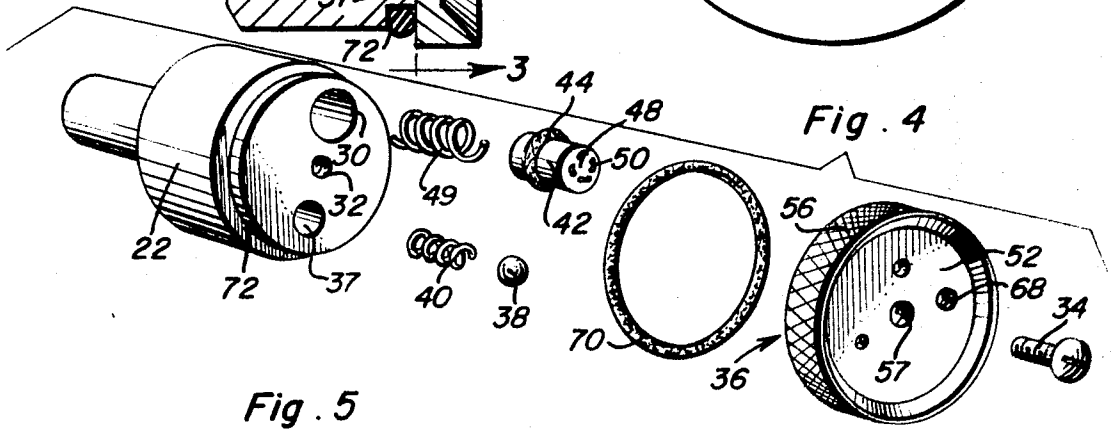
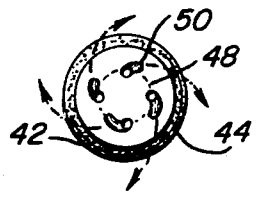


Fig . 4

Fig . 5



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ADJUSTABLE TURRET SPRAY NOZZLE

The present invention generally relates to crop-spraying equipment and more specifically to a spray nozzle attached to a spray pipe affixed along the trailing edge of the wings of an aircraft employed in crop spraying or dusting.

In conventional crop spraying apparatuses, a pipe having a plurality of spray nozzles affixed thereto is mounted along the trailing edge of the wings of an aircraft used for this purpose. Such spray nozzles conventionally include a discharge orifice of a particular size which will discharge a predetermined quantity of material dependent upon various factors including the size of the orifice itself. If it is necessary to change the size of the orifice, the nozzle either has to be completely replaced or disassembled and a different-sized orifice cap or plate associated therewith.

Accordingly, it is an object of the present invention to provide a spray nozzle having an adjustable turret or plate mounted thereon having circumferentially spaced orifices of different sizes which may be selectively aligned with a discharge passageway thereby controlling the characteristics of the material being discharged including controlling the quantity of such material. One portion of the rotatable plate or turret is imperforate so that the nozzle may be completely shut off if necessary for calibration.

Another object of the present invention is to provide an adjustable spray nozzle incorporating a sleeve in the flow passage in sealing engagement with the adjustable rotatable plate which includes spiral passageways through which liquid must pass to enter the nozzle orifice thereby discharging the spray material in a spiral swirling path for more efficient atomization and spreading thereof.

Still another feature of the present invention is to provide a spray nozzle which is relatively simple in construction, easy to attach to existing equipment, easy to adjust and relatively inexpensive to manufacture.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIG. 1 is a perspective view of the spray nozzle of the present invention incorporated into a crop-spraying aircraft wing structure illustrating the general relationship to the wing;

FIG. 2 is a vertical, sectional view taken substantially upon a plane passing along section line 2–2, on an enlarged scale, illustrating the specific construction of the adjustable spray nozzle;

FIG. 3 is a transverse, sectional view taken substantially upon a plane passing along section line 3–3 of FIG. 2 illustrating the interior surface construction of the rotatable nozzle plate;

FIG. 4 is an exploded group perspective view of the components of the present invention; and

FIG. 5 is a detailed sectional view of the sleeve having the spiral passages formed therein for swirling the spray material.

Referring now specifically to the drawings, the numeral 10 generally designates the spray nozzle of the present invention which includes a body 12 attached to a spray pipe 14 affixed in any suitable manner to the trailing edge of an aircraft wing 16 in a manner well known to those in the art of crop spraying or crop dusting. The body 12 includes a tubular pipe 18 which extends rearwardly and terminates in a screw-threaded end portion 20 to which the nozzle 10 is screw threadedly connected as illustrated in FIG. 2.

The nozzle 10 includes a generally circular or cylindrical body 22 provided with an internally threaded axially extending neck or boss 24 which is in screw-threaded engagement with the threaded end 20 of the pipe or nipple 18. The neck or boss 24 has a passage 26 therein communicated with an angularly extending passageway 28 that extends to and is in communication with an axially extending bore 30 which is

disposed eccentric with respect to the longitudinal center of the body 22 also as illustrated in FIG. 2 with the bore or passageway 30 being open to the outer end of the body 22 and closed at its inner end.

Centrally in the body 22, there is provided an inwardly extending and internally threaded bore 32 which communicates with the outer surface of the body 22 and which receives a conventional screw-threaded fastener 34 which secures a rotatable nozzle plate 36 in position on the body 22.

Diametrically opposed to the bore 30, the body 22 includes a blind bore 37 receiving a ball detent 38 and a compression spring 40 inwardly of the ball detent 38. The spherical ball detent 38 is urged outwardly of the bore 37 by the spring 40 which has one end seated in the bottom of the bore 37 and the other end engaging the spherical ball detent 38.

Disposed within the bore 30 is a hollow cylindrical sleeve 42 having an O-ring seal 44 in a groove on the exterior surface thereof in sealing engagement and sliding engagement with the interior surface of the bore 30. The center of the sleeve 42 is provided with a longitudinal bore 46 communicating with an open inner end and having an end plate 48 forming a closure for the outer end thereof which is substantially flush with the outer surface of the body 22 for engagement with the interior surface of the nozzle plate 36. A coil spring 49 is interposed between the inner end of the bore 30 and the inner end of the sleeve 42 for urging the sleeve outwardly for retaining the end plate 48 in contact with the nozzle plate 36. Also, provided in the end plate 48 is a plurality of spirally arranged passageways 50 which communicate the hollow interior bore 46 with the outer surface of the end plate 48 so that any liquid material discharged through the passageways or orifices 50 will be caused to be discharged in a swirling path.

The nozzle plate 36 is in the form of a circular plate 52 having a planar inner surface 54 and a knurled peripheral surface 56 for facilitating gripping engagement thereof. Centrally of the plate 52, there is provided a bore 57 receiving the screw-threaded fastener 34 and the outer surface of the plate 52 is set inwardly from the periphery of the nozzle with the transition surface being frustoconical in configuration as indicated at numeral 58 in FIG. 2 to provide protection for the nozzle plate and to generally limit the angle of discharge of the material being discharged through the nozzle plate 36.

The inner surface 54 of the plate 52 is provided with four circumferentially spaced recesses 60 three of which have apertures or orifices as at 62, 64 and 66 which are progressively larger in diameter with one of the recesses 60 being imperforate. The recesses are selectively alignable with the sleeve 42 and the surface of the end plate 48 having the spiral passages 50 therein so that material passing through the passages 50 will be swirled through the orifices 62, 64 and 66. The exterior surface of the plate 52 is also provided with three frustoconical recesses 68 in communication with the orifices 62, 64 and 66 respectively for providing an outward diverging angle for the discharge of material through the respective orifices.

The planar inner surface 54 of the rotatable plate 52 is sealed to the body 22 by an O-ring seal 70 received in a peripheral recess 72 in the outer end surface of the body 22 and the spring detent 38 will retain the nozzle plate 36 in adjusted position but the plate may be gripped and rotated to the next position for adjusting the size of orifice aligned with the passageway 50 in the sleeve 42 thus eliminating the necessity of employing tools or the like for removing one orifice plate and reassembling another orifice plate with the discharge nozzle. An index marker may be provided on the plate if desired and suitable indicia provided thereon to indicate the particular size of the orifice and, if desired, the plate may be positioned for completely closing the nozzle for whatever purpose desired.

The adjustable spray nozzle is attached to a pipe affixed along the trailing edges of the wings of an aircraft used in crop spraying or crop dusting and replaces the conventional spray nozzle which operates in a manner well known in the art. The

spray nozzle of this invention does not change the operation procedure in crop spraying or dusting and enables the orifice size of the nozzle to be easily changed without tools by rotating the turret or plate to the desired orifice size in a rapid and efficient manner. This structure also enables the nozzle to be completely shut off if necessary for calibration or for any other purpose. The device may be constructed of various non-corrosive or corrosive resistant materials so that it will effectively retain its working characteristics and also, the particular structure of the nozzle itself provides an effective control for the discharge rate and also an efficient atomization and spreading of the spray material due to the angulation of the passageways and the swirling discharge pattern provided thereby.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

What we claim as new is as follows:

1. A spray nozzle comprising a body having a passage therein communicating with a source of material to be discharged, a plate movably mounted in relation to said body and overlying the passage therein, said plate including a plurality of orifices therethrough for selective alignment with the passage, said orifices being of different sizes to vary the rate of discharge of material from the nozzle, and means in said passage for imparting a turbulent flow to the material being discharged through an orifice in the plate, said orifices being oriented in circumferentially spaced relation in a circular pattern in said plate, means mounting the plate on said body for rotational movement about an axis centrally of the body and the circular pattern of the orifices, and means interengaging said body and plate for releasably locking the plate in rotatably adjusted position in relation to the body, said means for imparting turbulent flow consists of a sleeve, spring means biasing the sleeve toward the rotatable plate, said sleeve having a closed end engaging the plate, said closed end of the sleeve having a plurality of angulated passageways therethrough for imparting turbulent flow to the material.

2. A spray nozzle comprising a body having a passage therein communicating with a source of material to be discharged, a plate movably mounted in relation to said body and overlying the passage therein, said plate including a plurality of orifices therethrough for selective alignment with the passage, said orifices being of different sizes to vary the rate of discharge of material from the nozzle, and means in said passage for imparting a turbulent flow to the material being discharged through an orifice in the plate, said orifices being oriented in circumferentially spaced relation in a circular pattern in said plate, means mounting the plate on said body for rotational movement about an axis centrally of the body and the circular pattern of the orifices, and means interengaging said body and plate for releasably locking the plate in rotatably adjusted position in relation to the body, said plate including a plurality of recesses on the inner surface thereof forming an inlet for each orifice with the recesses aligned with the passage, said means interengaging the body and plate including a spring-biased ball detent mounted within said body, wherein said recesses in the inner surface of the plate are spherical in configuration for receiving the ball detent and enabling rotation of the plate by overcoming the force exerted by the spring-biased ball detent, the entire plate being forward of the body of the nozzle and the plate's periphery being disposed outwardly of the periphery of the body for ease of grasping thereof with the periphery of the plate being roughened for preventing slippage of the hand when manually grasping the plate and rotating it about an axis identical with the center line of the body of the nozzle.

3. The structure as defined in claim 2, wherein said means for imparting turbulent flow consists of a sleeve, spring means biasing the sleeve toward the rotatable plate, said sleeve having a closed end frictionally engaging the plate, said closed end of the sleeve having a plurality of angulated passageways therethrough for imparting turbulent flow to the material.

4. The structure as defined in claim 3 wherein said spring-biased sleeve includes a seal on the periphery thereof in sealing engagement with the passage with the seal enabling longitudinal sliding movement of the sleeve within said passage.

5. The structure as defined in claim 4 wherein said body including peripheral groove at the end thereof adjacent the plate, and a seal disposed in said groove and sealing the periphery of the plate to the body.