

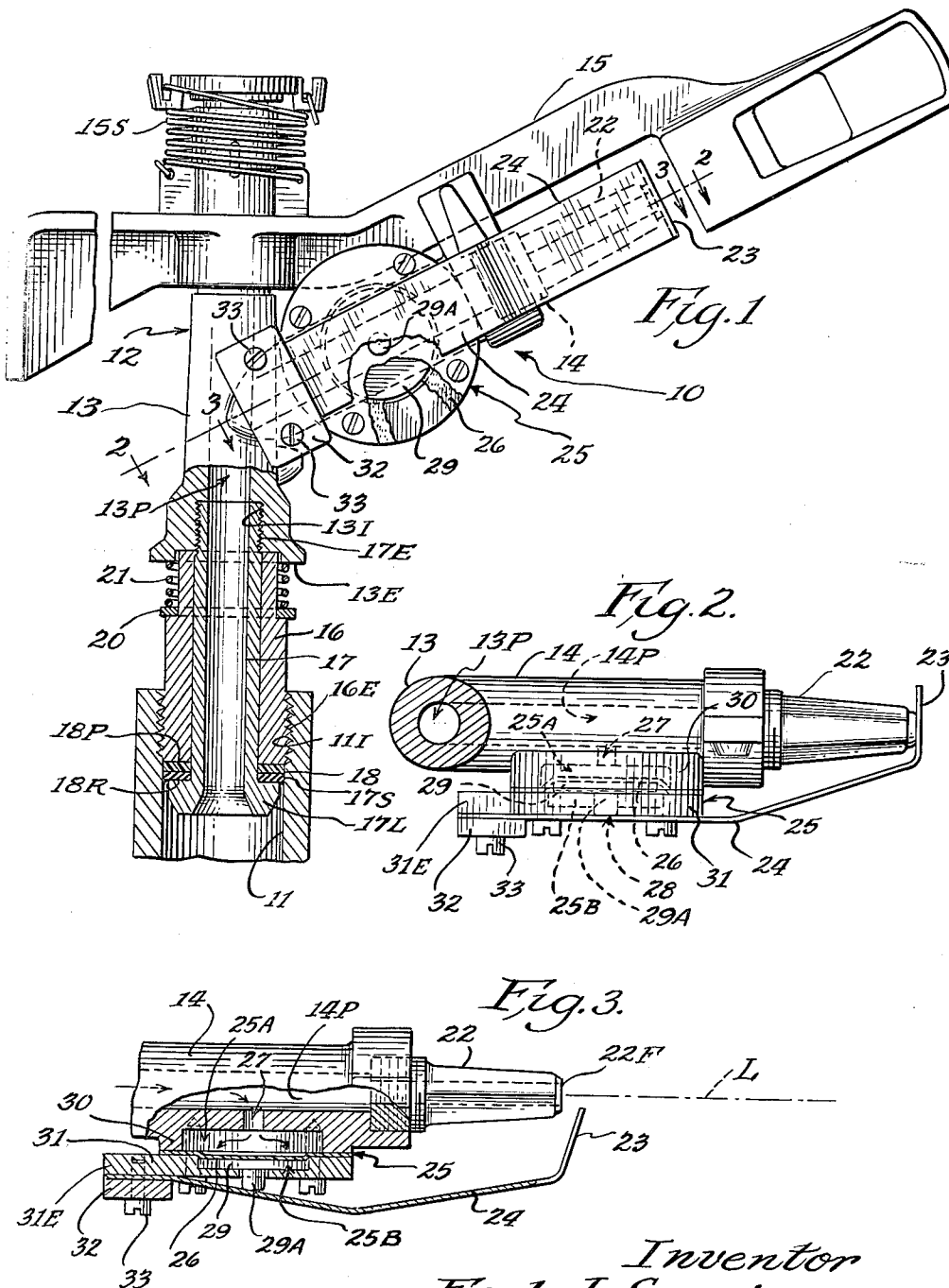
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ROTARY SPRINKLER

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ROTARY SPRINKLER

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This invention relates to an automatic closure for blocking external access to the discharge opening of a spray nozzle device, and more particularly is concerned with an automatic closure that normally blocks the nozzle discharging opening and is shiftable in response to pressure of liquid within the nozzle to unblock the opening and permit normal discharge therethrough.

One important application of this invention exists in the hammer or impulse type of rotary sprinkler such as is now being used extensively for citrus irrigation. Commonly, these rotary sprinklers are spaced from 50 to 100 feet apart and employ nozzles with a discharge opening having a diameter in the range of $\frac{1}{8}$ to $\frac{5}{16}$ inch.

A common trouble with sprinklers employed for citrus irrigation is created by "mud daubers" and other wasps and bees who find the nozzle discharge opening a convenient place to build their nests. Where the sprinkler is not used for several days, the nozzle can actually become completely blocked by these nests. In citrus groves the spray nozzle head is carried atop a fixed riser and may be located as much as 20 or 30 feet in the air. Thus, blockage of the nozzle presents a difficult maintenance problem due to the difficulty of providing access to the actual nozzle opening. Where hundreds and even thousands of sprinklers are used in a single system, the maintenance problem is very serious.

The principal object of the present invention is to provide an automatic closure for blocking external access to the nozzle discharge opening when the device is not in use.

Another object of the invention is to provide such an automatic closure controlled by pressure of liquid therein.

Still another object of the invention is to provide an automatic closure responsive to liquid pressure and spring biased to normally maintain the discharge opening blocked only when pressure is not acting within the device.

In one form the invention provides such an automatic closure in which a flexible diaphragm is exposed to the pressure conditions within the device and is distortable to move a shiftable actuator in a direction of movement opposed by a bias spring and to hold the actuator so long as a predetermined pressure value is maintained within the device.

Other objects and advantages of the invention will become apparent during the course of the following description.

In the accompanying drawings forming a part of this specification and in which like numerals are employed to designate like parts throughout the same:

FIG. 1 is an elevational view of an impulse hammer type sprinkler head equipped with one form of automatic closure in accordance with this invention, with parts thereof broken away and sectioned to facilitate the disclosure;

FIG. 2 is a fragmentary plan view partly in section and taken as indicated generally by the line 2-2 of FIG. 1; and

FIG. 3 is a fragmentary section taken as indicated on the line 3-3 of FIG. 1 and illustrating the parts in changed position.

Referring now to FIGS. 1 to 3 of the drawings, a sprinkler device of the impulse hammer operated type is shown generally at 10 and is rotatably mounted atop a riser 11. In the case of citrus groves, it will be under-

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stood that these risers may be spaced at 50 or 100 foot intervals over the area to be sprayed and may project 20 to 30 feet above ground with a common source of water under pressure being connected to a plurality of risers through an underground conduit system (not shown).

The sprinkler device as illustrated in FIG. 1 includes a spray nozzle head 12 that includes a vertical stem 13 and a nozzle tube 14 directed obliquely upwardly from the stem at a location intermediately therealong. The head 12 has an inertially operated impulse hammer mechanism 15 swingably mounted thereon at the upper end of the stem 13 for oscillation about a vertical axis coincident with the axis of the riser 11. The head 12 is mounted for rotation on the upper end of the riser 11 and for this purpose a tubular bearing 16 has external threading 16E on its lower end for fixed engagement with internal threading 11I within the upper end of the riser 11.

A tubular spindle 17 projects through and is arranged in rotatably journaled relation within the bearing 16. The spindle 17 has external threading 17E on its upper end fixedly engaged with internal threading 13I within the enlarged lower end of the nozzle head stem 13. The spindle 17 has a lower end enlargement 17L providing an annular seat 17S that receives a laminar annular gasket 18 having a rubber face 18R in stationary sealing engagement with the seat 17S and having a lubric plastic face 18P in rotary sliding engagement with the axial end face of the bearing 16. The bearing 16 has a reduced upper end receiving a washer-like seat ring 20 and a helical coil spring 21 that reacts between the bearing 16 and in an axial end face 13E on the lower end of the nozzle head while accommodating relative rotation therebetween.

The nozzle head 12 provides a vertical stem passage 13P opening into a nozzle passage 14P that collectively comprise a discharge flow passage for the head. A separate nozzle tip 22 may be threadedly fixed in the nozzle tube 14 to form an extension thereof and of the flow passage with the tip 22 terminating in nozzle face portions 22F that border and define a discharge opening for the flow passage.

This construction enables tips of different size to be used interchangeably in a standardized nozzle head to provide any desired spray characteristic.

During normal use of the device, the riser 11 (which is connected to an underground conduit system equipped with a suitable shut-off valve) serves to supply liquid under pressure into the head 12 to flow through the stem passage 13P and the nozzle tube passage 14P for discharge through the discharge opening along a line such as is generally indicated at L in FIG. 3. The spray discharge acts upon the hammer element 15 in the usual way and in conjunction with the return spring 15S or the hammer element, intermittent or step-by-step unidirectional movement of the sprinkler head results so that each sprinkler ultimately covers a circular area. When the sprinklers are turned off by closing the shut-off valves of the main distribution system, it usually results that the nozzle tube 14 and tip 22 are free of liquid and they have been found to offer attractive nesting facilities to mud daubers and other wasps and bees.

In accordance with this invention, the blockage problem resulting from the nesting tendency of these insects is eliminated by providing an automatic closure for blocking external access to the discharge opening. Accordingly, a gate 23 is arranged, when at a closed position, as illustrated in FIGS. 1 and 2, to extend generally crosswise of the line L to span the nozzle discharge opening at a location adjacent the nozzle face portions 22F and substantially close the discharge opening. The gate 23

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is preferably comprised by a bent over end region of a leaf spring element 24 that is mounted to the nozzle head normally to hold the gate 23 at its closed position and to resiliently yieldably resist shifting movement of the gate to an open position (see FIG. 3) wherein the gate 23 is clear of the discharge opening and of the spray line L. Such shifting movement is preferably oriented along a direction generally crosswise of the line L.

A pressure capsule 25 is mounted on the nozzle head 12 to respond to liquid pressure conditions in the flow passage and actuate the leaf spring 24 to deflect the same and shift the gate 23 to its open position only when liquid is acting at a predetermined pressure value within the head 12.

The pressure capsule 25 has a flexibly distortable partitioning diaphragm 26 therein and dividing the same into separate inner and outer chambers 25A and 25B, respectively. The nozzle tube has a lateral wall opening 27 communicating with the inner chamber 25A, and the pressure capsule has a wall opening 28 establishing communication between the outer chamber 25B and atmosphere. An actuator 29 is disposed in the outer chamber and has an arm 29A projecting through the corresponding wall outlet to be movable in response to outward flexing of the diaphragm 26, that is, flexing movement of the diaphragm in a sense to expand the inner chamber 25A and contract the outer chamber 25B, to cause the actuator arm to move through and project beyond the capsule into deflecting engagement with the leaf spring element 24.

The pressure capsule 25 is composed of a pair of mating rigid shells 30 and 31 having facing annular surfaces gripping marginal regions of the diaphragm 26 to define the chambers 25A and 25B. The inner shell 30 is preferably integral with the nozzle tube 14. The outer shell 31 has an edge extension 31E on which a clamp bar 32 is affixed by suitable screws 33 to engage the end of the leaf spring 24 and define a mounting point therefor. Thus, an intermediate region of the leaf spring spans the opening 28 in the outer shell 31 that guides the actuator arm 29A, and outward displacement of the actuator 29 causes flexing of the leaf element 24 from its closed position of FIG. 2 to its open position of FIG. 3 to swing the gate 23 free of the discharge opening. In the preferred form illustrated herein, the actuator 29 is a one-piece element having a circular disc substantially spanning the outer chamber and having an axial stem constituting the actuator arm.

While specific embodiments of the invention have been illustrated herein, it is to be understood that changes and variations may be made by those skilled in the art without departing from the spirit and scope of the appended claims.

What is claimed is:

1. In a spray discharge device that includes a spray nozzle tube defining a flow passage and terminating in nozzle face portions bordering and defining a discharge opening leading from said passage, and means for supplying liquid under pressure to said tube to flow through said passage and opening and define a line of spray discharge, said tube having a lateral wall opening, a pressure capsule spanning said lateral wall opening and mounted in rigid sealing relation therearound, said pressure capsule having a flexibly distortable partitioning diaphragm providing separate

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chambers therein, said capsule having a wall opening establishing open communication between said passage and one of said chambers, said capsule having a wall opening defining an outlet for the other of said chambers, an actuator in said other chamber and having an arm projecting through said outlet and responsive to flexing of said diaphragm in a direction to expand said one chamber and contract said other chamber to move said arm beyond said outlet, an elongated spring leaf element having a mounting point adjacent one end thereof and a laterally directed gate at its other end, means for attaching the mounting point of said leaf element to said capsule to dispose an intermediate region of the leaf element in a normal position extending across said outlet and along side the nozzle tube and to dispose the gate in spanning relation across said discharge opening to substantially close the same, such that said arm in responding to movement of the diaphragm occasioned by pressure in said passage engages and deflects said leaf element to swing the gate from said discharge opening.

2. In a spray discharge device that includes a spray nozzle tube defining a flow passage and terminating in nozzle face portions bordering and defining a discharge opening leading from said passage, and means for supplying liquid under pressure to said tube to flow through said passage and opening and define a line of spray discharge, said tube having a lateral wall opening, a pressure capsule composed of a pair of mating rigid shells, a diaphragm spanning said shells and engaged therebetween to define separate adjacent chambers in said capsule, means mounting one of said shells to span said lateral wall opening in rigid sealing relation therearound, said one shell having a wall opening establishing open communication between said passage and one of said chambers, the other shell having a wall opening defining an outlet for the other of said chambers, an actuator in said other chamber and having an arm projecting through said outlet and responsive to flexing of said diaphragm towards said outlet to move a portion of said arm beyond said outlet, an elongated spring leaf element having a mounting point adjacent one end thereof and a laterally directed gate at its other end, and means for attaching the mounting point of said leaf element to said capsule to dispose an intermediate region of the leaf element in a normal position extending across said outlet and along side the nozzle tube and to dispose the gate in spanning relation across said discharge opening to substantially close the same, such that said arm in responding to movement of the diaphragm occasioned by pressure in said passage engages and deflects said leaf elements to swing the gate from said discharge opening.

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