

[54] WATER SPRINKLER DEVICE

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[22] Filed: July 22, 1971

[21] Appl. No.: 165,158

[52] U.S. Cl.239/206, 239/230, 239/241

[51] Int. Cl.B05b 3/04

[58] Field of Search.....239/204, 205, 206, 230, 237, 239/240, 241

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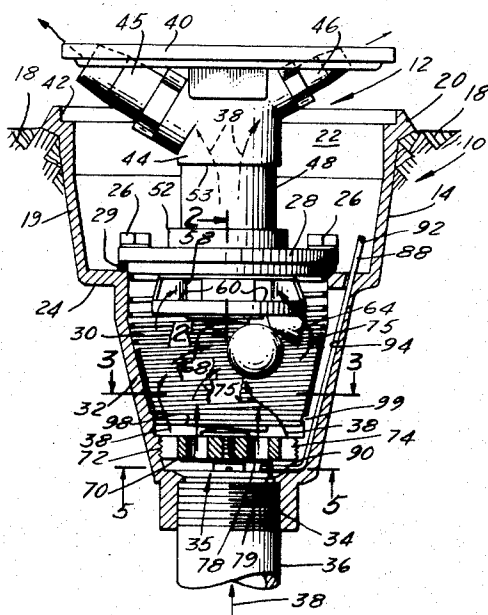
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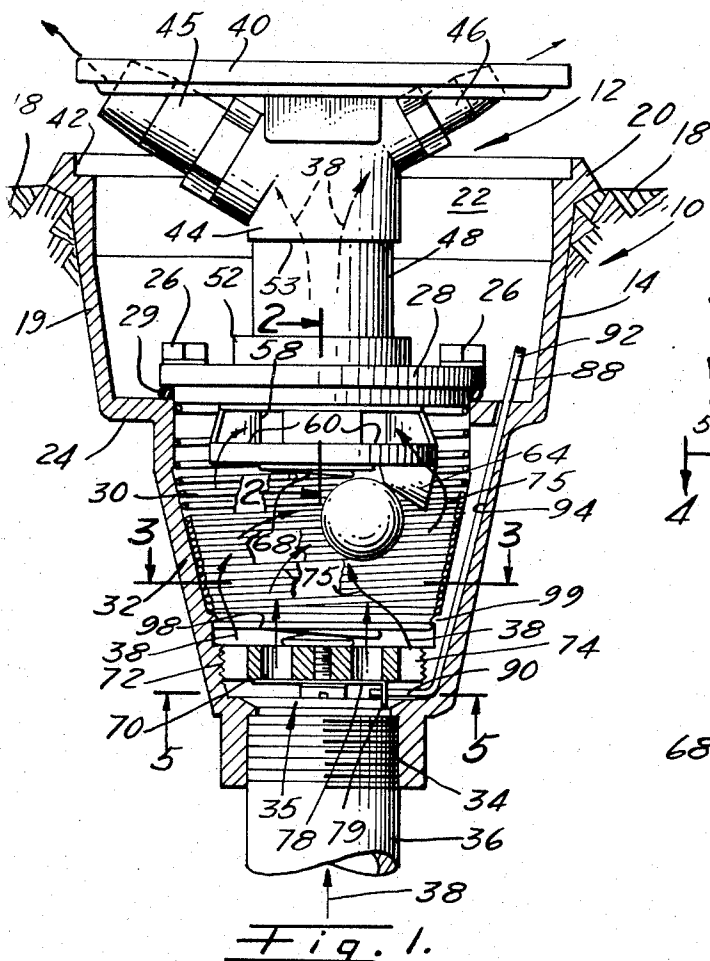
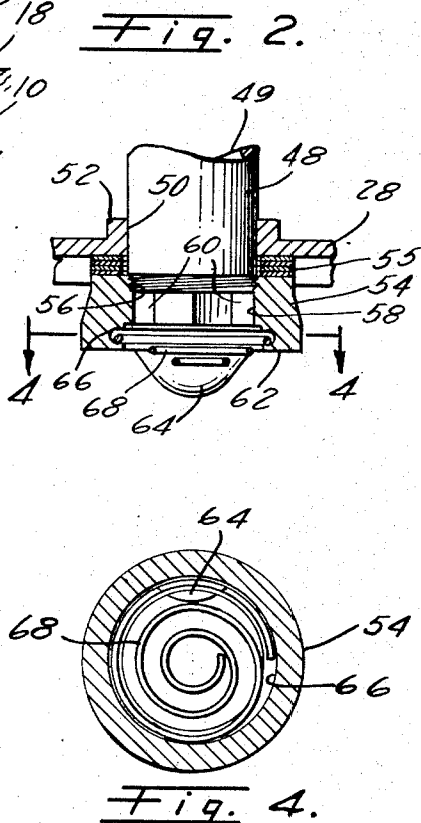
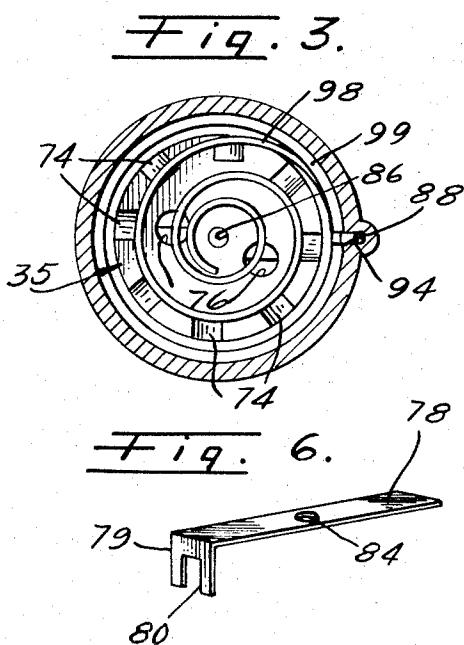
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ABSTRACT

A water sprinkler device comprising a main body housing having a dual pop-up spray nozzle with a cover attached thereto for movement with the spray nozzle, the nozzle being axially aligned within the main body and movably supported in a bearing wall member which is secured intermediate the ends of the main body housing, the spray nozzle being provided with a striking base member for rotating the dual spray nozzles by means of a ball striking the base member. A helical spring is disposed within the base member and a second helical spring is also disposed and secured in the lower portion of the main housing. A valve disc is secured into the lower portion of the main body, said disc having annularly arranged slots and a pair of centrally positioned flow passages which are adjustable for regulating the amount of water passing therethrough by a valve member and a connecting valve-adjusting stem.

10 Claims, 6 Drawing Figures





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WATER SPRINKLER DEVICE**BACKGROUND OF THE INVENTION****1. Field of the Invention**

This invention relates generally to a sprinkler device for watering large surface areas and, more particularly, to a pop-up rotatable, fluid-pressure operable sprinkler device having a large volume of water flowing therethrough.

2. Description of the Prior Art

As is well known in the art, various problems and difficulties are encountered in providing suitable means for watering lawns and the like, particularly where the surface area to be watered is of considerable magnitude.

Many various types of sprinkler devices are used for the flow of large volumes of water. However, these devices have features that restrict their use, and are complicated to operate and expensive to maintain. One such sprinkler device incorporates a free standing sprinkler head that cannot be removed once placed in a sprinkler system. These sprinkler heads project above the ground and become a hazard if that particular area of the ground is to be used for other purposes. Another type of sprinkler device is similar to be above but has a removable sprinkler head. This particular sprinkler system is comprised of a complex mechanism which is costly to operate. The pop-up sprinkler device is being used to solve many of the above problems. But here, again, due to the high pressure and the large volume of water flow, wear is a factor. However, the following description of the applicant's invention will show how the above problems have been overcome.

SUMMARY OF THE INVENTION

The present invention comprises a pop-up sprinkler device having a hollow body, the lower open end of which is internally threaded to receive a pipe or conduit, the upper free end thereof being enlarged to receive a movable cap or cover fixedly attached to a dual sprinkler head for vertical and rotational movement therewith.

Secured within the hollow body and intermediate the ends thereof is a bearing plate which slidably and rotatably receives the tubular conduit of the sprinkler head assembly. A pair of dual spray nozzles are mounted to the upper end of the conduit while the opposite end is threadably attached to a striking base member, whereby the bearing plate can support the sprinkler head assembly, while not in use, but allows the assembly to rise a predetermined distance by use of spacer rings and the base member when the water pressure increases within the hollow body, forcing the assembly upward.

Included within the hollow body is a free moving ball which is activated by the swirling action of the water, causing the ball to whirl upwardly and strike a lug or shoulder projecting downwardly into the interior of the main body, thereby forcing the sprinkler assembly to rotate at a specific stabilized rate.

The swirling action of the water is created by the water being forced through a valve plate or disc having annularly inclined, arranged slots, the plate being disposed in the lower smaller opening of the main body. This swirling action of the water, together with the movement of the ball, is controlled by regulating the

amount of water flowing through a pair of vertical passages positioned within the valve disc. This is accomplished by a valve member movably secured to the under side of the disc and adjusted by means of a valve-adjusting stem.

Suitably positioned above the valve disc is a helical spring which is adapted to absorb the striking force of the ball, so as to protect the valve disc from wear and damage. Similarly, a second helical spring is disposed within the frame structure of the base member, so that when the ball strikes the sprinkler assembly, other than the extending lug, no damage will occur to any parts thereon.

OBJECTS AND ADVANTAGES OF THE INVENTION

The present invention has for an important object a provision wherein the rate of rotation of the sprinkler head may be easily regulated without controlling the volume of water flow.

It is another object of the invention to provide a sprinkler device of this character wherein the major wear areas of the body and parts are held to a minimum by use of helical spring members.

It is still another object of the invention to provide a pop-up sprinkler device with an easily adjustable control valve.

It is a further object of the invention to provide a rotary pop-up sprinkler device having relatively few operating parts.

It is still a further object of the invention to provide a device of this character that is easy to service and maintain.

Still another object of the invention is to provide a device of this character that is relatively inexpensive to manufacture.

It is still a further object of the invention to provide a pop-up sprinkler device that is simple and rugged in construction.

The characteristics and advantages of the invention are further sufficiently referred to in connection with the accompanying drawings, which represent one embodiment. After considering this example, skilled persons will understand that variations may be made without departing from the principles disclosed and I contemplate the employment of any structures, arrangements or modes of operation that are properly within the scope of the appended claims.

DESCRIPTION OF THE DRAWINGS

Referring more particularly to the accompanying drawings, which are for illustrative purposes only:

FIG. 1 is a transverse view, partially in section, showing the sprinkler device in an active position;

FIG. 2 is a sectional view taken on line 2—2 of FIG. 1;

FIG. 3 is a sectional view taken on line 3—3 of FIG. 1;

FIG. 4 is a sectional view taken on line 4—4 of FIG. 2; and

FIG. 5 is a sectional view taken on line 5—5 of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring more particularly to FIG. 1, there is shown a pop-up sprinkler device, indicated generally at 10, having a sprinkler head assembly, generally indicated at 12, disposed and secured in a hollow body 14.

The hollow body is molded from a suitable material, such as metal or plastic. However, for best results a brass metal is used for strength and to act against corrosion when disposed in the ground 18 and positioned level thereto. That is, the upper enlarged portion 19 of the body 14 is positioned so that a circumferential lip 20 is just above ground level where the general height thereof is less than the height of the surrounding growth (not shown), in order not to interfere with mowing operations which generally include lawn mowers, grass cutting devices, and the like.

A cylindrical cup-like chamber 22 is defined by the upper enlarged circular wall 19 and an inwardly formed flange 24, to which the sprinkler head assembly is attached thereto by bolts 26. The bolts 26 pass through a bushing or bearing plate 28 and are secured within the flange 24, providing a sealed cover by means of O-ring seal 29. When the bearing plate 28 is secured in place, a second lower chamber 30 is defined by said bearing plate and an intermediate body portion 32 which may be considered an inverted frusto-conical part. To partition said chamber 30 from an internally threaded lower inlet port 34, there is disposed therebetween a valve assembly, generally indicated at 35, through which a large volume of water is forced therethrough from inlet pipe or conduit 36. The flow of the water is illustrated in FIG. 1 by arrows 38. The valve assembly will hereinafter be described in more detail.

The sprinkler head assembly 12 comprises a cover plate 40 having a diameter slightly smaller than the diameter of an annular recess 42 defined by a flaring lip 20 of the upper portion of wall 19. Cover plate 40 is attached in such a manner as to move with said sprinkler head assembly 12 as it rotates, or as the assembly 12 moves vertically upwardly and downwardly.

In FIG. 1 the cover plate 40 is shown in a raised position. However, when the flow of water is shut off the cover lowers with the assembly 12 and rests within the recess 42, protecting the chamber 22 from foreign materials, such as grass cuttings and dirt.

A dual spray nozzle unit 44 is provided with oppositely arranged discharge orifices 45 and 46, respectively. Said spray nozzle unit 44 is secured at the upper end of a cylindrical tubular body 48, said body having a hollow passage 49, as seen in FIG. 2. The tubular body is movably supported within the bearing plate 28 and axially aligned with the main body 14 and inlet pipe 36. In FIG. 2 it can be seen that plate 28 is provided with a centrally positioned bearing opening 50 defined by a cylindrical flange 52 in which the tubular body 48 is received. Downward movement of the body 48 is limited by shoulder 53 of the nozzle unit 44 when it engages flange 52, and the upward movement thereof is limited by a striking base member 54 and spacer rings 55. Said base member 54 is provided with internal threads 56 which receive the lower threaded end of the tubular body 48. Since a large volume of water is required to flow through sprinkler device 10, the base

member has a central passage 58 and a plurality of radial openings 60 communicating therewith, particularly for receiving the swirling flow of water as it reaches the upper areas of the lower chamber 30. Protruding downward from the bottom annular wall 62 of the base member 54 is a lug 64, as seen in FIGS. 1 and 2. Said depending lug 64 is curved from its inner upper end downwardly and outwardly, and is also curved arcuately outwardly in opposite directions from the inner central region. In addition to lug 64 of the base member 54, there is formed an annular recess 66 within the lowermost portion of the passage 58, said annular recess being provided for the mounting of a helical coil spring 68. When the spring 68 is placed within the recess by said spring's enlarged coiled end, the lower smaller coiled end protrudes downwardly a sufficient distance to be freely exposed below the bottom annular wall 62.

The valve assembly 35 comprises a disc 70, adapted with external threads 72 so as to be secured into the lower body portion 32, just about the inlet port 34, forming a bottom member for said chamber 30 of the intermediate body portion. Annularly arranged about the disc 70 are a plurality of slots 74 which are all inclined in the same direction (see FIGS. 3 and 5) to cause water passing therethrough to swirl upwardly within the interior of the intermediate portion 32, the direction of swirling motion of the water passing through said slots being indicated by the arrows 75 in FIG. 1.

The disc 70 is also provided with a pair of vertical passages 76, the axes of which are parallel to the axis of the disc 70. Flow of water or fluid through said passages 76 is controlled by a valve plate member 78 which comprises a flat piece of any suitable material, such as metal or plastic, having one end thereof bent at right angles, as at 79 in FIG. 6. This bent end 79 has a notch 80 cut therein, said end 79 being positioned downwardly when secured to the underside of disc 70 by a screw 82 which freely passes through hole 84 of valve plate member 78 into a threaded hole 86 of the disc 70.

There is provided a means for adjusting the valve plate 78 for partially covering or completely covering passages 76 whereby the flow of water therethrough may be controlled. The adjusting means comprises an elongated rod 88 having at its lower end an arm 90 bent normal to the axis of said rod, said rod having an L-shaped configuration, and its upper end provided with a slot 92, whereby an object such as a screwdriver can be fitted therein for rotational adjusting movement when required.

As seen in FIG. 1, the rod 88 is arranged to be movably supported within the body portion 32, said rod being vertically disposed within a longitudinal groove or channel 94 formed in the inner wall of the lower chamber 30.

For a more clear understanding of the adjusting means, there is shown in the sectional view of FIG. 5 two positions of the valve member 78. The valve member illustrated in full lines is generally the normal position, wherein each passage 76 is half closed and the arm 90 is directed inwardly through the notch 80 in a parallel relation to said valve 78. The valve member illustrated in phantom lines indicates one of the various

positions in which the valve member can be adjusted when required. The passages 76 are fully open and the arm 90 of the rod 88 has been adjusted to one side, causing the valve member to rotate to a fully open position. That is, the water is allowed to freely flow without obstructions through passages 76.

Within that portion of the lower body 32 between the disc 70 and the bearing plate 28, there is freely disposed a striking means, such as ball 95, which may be of any suitable character, said ball being shown in FIG. 1, however, as a steel ball, such as a ball bearing, which may be plated with rust or corrosion-resistant material, such as chrome or any suitable material. The diameter of the ball 95 is smaller than the diameter of the lower end of the intermediate body portion 32, and said ball is adapted to be forced upwardly and circularly within the chamber 30 by the water flowing through the slots 44.

Fluid or water is supplied to the sprinkler head by the conduit or pipe 36 which is vertically disposed and is provided at its upper end with an externally threaded end portion 96 which is threadably received within the lower inlet port 34.

When the water is turned off and the device is inoperative, the ball 95 rests on a disc-protecting means which comprises a loosely coiled helical spring 98 secured by spring tension between the upper face of disc 70 and an annular shoulder 99. Thus, spring 98 protects the slots 74 and passages 76 from being damaged by the hard steel ball hitting the soft metal of the disc 70.

When water is allowed to flow into the sprinkler head, the water from pipe 36 flows upwardly through the slots 74 into the chamber 30 of the body between the disc and bearing plate 28. The pressure of the water flowing from the slots 74 into the chamber 30 forces the sprinkler head assembly 12 to slide upwardly in the bearing plate 28, as in FIGS. 1 and 2 of the drawings. At the same time, ball 95 is forced in an upward spiral path on the interior of chamber 30. The chamber 30 is provided with a coil spring 100 which lines the interior wall thereof and is shaped to correspond thereto. The lower end of the spring 100 engages the annular shoulder 99 just above the disc 70 and, at this lower end, the coils of the spring 100 are normally in contact with each other. However, the upper part of the spring 100, that is the part of said spring disposed in the upper portion of chamber 30, is loosely coiled so that the respective coils are spaced apart, as best seen in FIG. 1. It is to be noted that the portion of the spring 100 is frusto-conical in shape but inverted so that the smaller end of said spring is at the bottom thereof. The upper end of the spring 100 disposed within the top of chamber 30 of the body is cylindrical. When said spring is within the chamber 30 and the bearing plate 28 is secured in place, the upper coils of said spring are placed under compression so that, in effect, the entire spring is under compression.

The swirling action of the water causes the ball to twirl around in the spring 100 and, when the ball reaches its upper position as shown in FIG. 1, it will strike the lug 64 and cause the nozzle to rotate a limited amount. Because of the curved inner surface of the lug 64, the ball will pass over said surface and beyond the lug 64. Due to the large volume of water flow through

the sprinkler device 10, the passage 58 of the base member 54 and the passage 49 of the body 48 has to be of such a character to accommodate said flow without allowing the swirling ball to be forced upward therein. Therefore, the helical spring 68 is arranged in the base member 54, as hereinbefore described, to protect the passages from damage and to prevent the ball 95 from entering said passages and clogging the sprinkler head assembly.

Now that the ball is prevented from entering the passages, it will continue to move around the interior surfaces of the coils of springs 100 and will repeatedly engage the protruding lug 64. Each time the lug 64 is hit by the ball 95 the sprinkler assembly 12 along with the nozzles are rotated another increment of movement. This operation will continue as long as there is water supplied to the device.

It is to be noted that while the above is occurring water is also being forced through the vertical passages 76 at a controlled rate and directed into the chamber 30 of the body 32, generally parallel to the axis thereof. Because of the upward parallel force of the stream of water through the passages 76, the swirling action of the water entering the chamber 30 of the body through the slots can be affected in such a manner that, with the aid of the control valve assembly, the swirling action can be changed. The less water that is allowed to pass through the passages 76 by adjusting valve member 78 the faster the swirling action takes place, which in turn speeds the engagement of the ball 95 with the lug 64. It should be understood that the flow volume of water remains the same while the sprinkler head 12 increases its revolutions per minute. Conversely, if the passages are opened by turning rod 88, as shown in FIG. 5, the pressure and flow increase through passages 76, interfering with the action of the water and reducing the swirling movement of the ball, thus causing the ball to engage the lug 64 less than before. Hence, the rotational speed of the sprinkler head is reduced without substantial loss of water volume through the nozzles thereof.

The invention and its attendant advantages will be understood from the foregoing description and it will be apparent that various changes may be made in the form, construction and arrangement of the parts of the invention without departing from the spirit and scope thereof or sacrificing its material advantages, the arrangement hereinbefore described being merely by way of example, and I do not wish to be restricted to the specific form shown or uses mentioned, except as defined in the accompanying claims.

I claim:

1. In a sprinkler head, comprising:

- A. a hollow body, said body having a fluid inlet at the lower end;
- B. a nozzle operably mounted at the upper end of said body for rotational movement, said nozzle having an inlet and at least one discharge orifice;
- C. a flange at the lower end of said nozzle;
- D. a helical coiled spring covering the nozzle inlet;
- E. a ball operably disposed within the body;
- F. and means for swirling fluid introduced into said body.

2. The invention defined by claim 1, wherein there are a plurality of fluid receiving radial openings at the inlet of the nozzle.

3. The invention defined by claim 1, wherein the helical coiled spring prevents the ball from lodging in the inlet of the nozzle while permitting water to flow into said nozzle.

4. In a sprinkler head assembly comprising:

A. a hollow body, having a fluid inlet at the lower end thereof;

B. a nozzle operably mounted at the upper end of said body for rotational movement therein, said nozzle having an inlet and at least one discharge orifice;

C. means at the fluid inlet for the body for swirling fluid introduced into said body;

D. a striking means disposed within said body for engaging said nozzle at its lower end, thereby imparting movement to said nozzle;

E. and a helical coiled spring disposed at said fluid inlet of said body and arranged to cover said means for swirling fluid introduced into said body.

5. In a sprinkler head, as recited in claim 4, wherein said means for swirling fluid comprises a disc having plurality of annularly arranged inclined slots for passage of said fluid therethrough in a swirling upward motion, activating said striking means; and at least one vertical opening arranged in parallel relation with the axis of said body whereby fluid can flow directly upward.

6. The invention defined by claim 5, including a valve plate movably secured to said disc, said valve plate positioned to control said fluid flow through said vertical opening.

7. The invention defined by claim 1, including a second helical coiled spring disposed in said fluid inlet of said body to protect the means for swirling fluid introduced into said body.

8. The invention defined by claim 7, including adjusting means within the sprinkler head for regulating the

flow of fluid through the means for swirling fluid introduced into said body.

9. In a sprinkler head assembly comprising:

a hollow body, having a fluid inlet at the lower end thereof;

a nozzle operably mounted at the upper end of said body for rotational movements therein, said nozzle having an inlet and at least one discharge orifice;

a striking means disposed within said body for engaging said nozzle at its lower end, thereby imparting movement to said nozzle;

means for swirling fluid introduced into said body, said means including a disc having a plurality of annularly arranged, inclined slots for fluid flow therethrough in a swirling, upward motion for activating said striking means; and a valve plate movably secured to said disc, said valve plate positioned to control said fluid for swirling fluid introduced into said body; and

adjusting means for adjusting the means for swirling fluid introduced into said body, said adjusting means including an actuator operably within the hollow body having an internal vertical channel therein and a rod adapted to be disposed in said channel for engagement with said valve plate to adjust said plate for varying fluid flow through the inclined slots of said disc.

10. The invention defined by claim 9, wherein there is a vertical channel in the wall of said body and the adjusting means comprises an elongated rod disposed within said channel, the lower end of said rod being bent inwardly for operable engagement with said valve plate, the upper end of said rod being provided with means for rotating said rod, whereby said valve plate can be adjusted for controlling the flow of fluid to said disc; and wherein said striking means includes a ball.

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