

Aug. 14, 1951

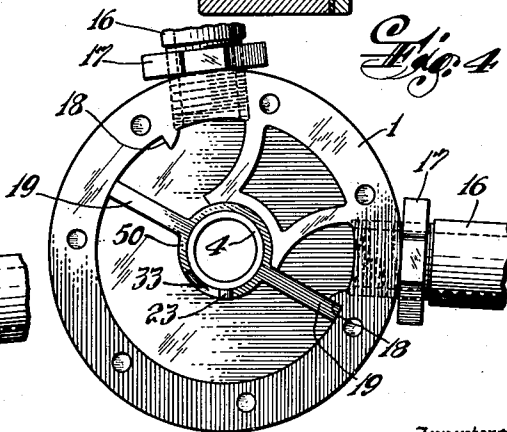
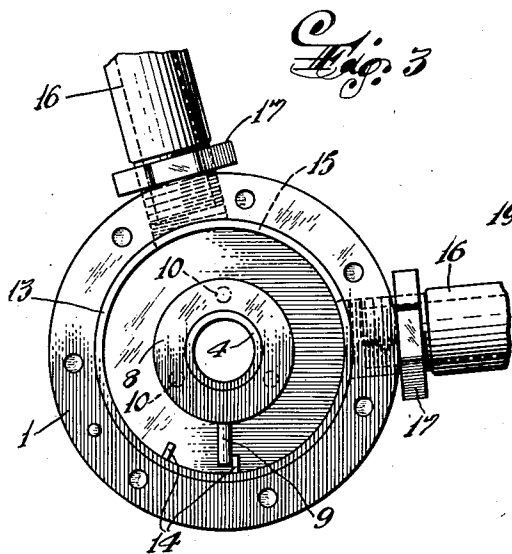
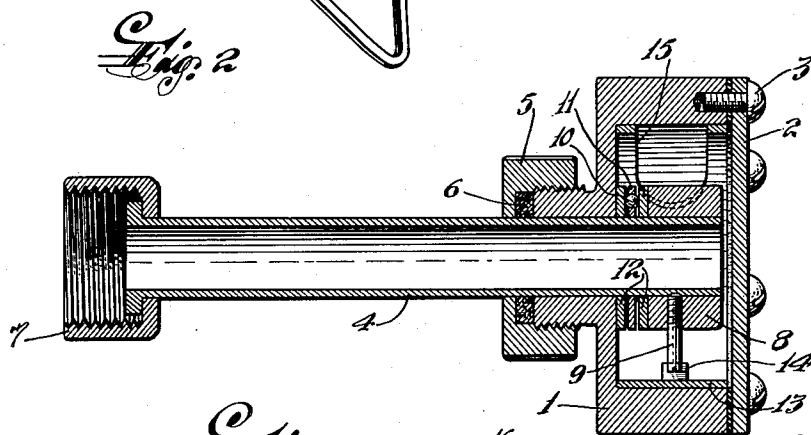
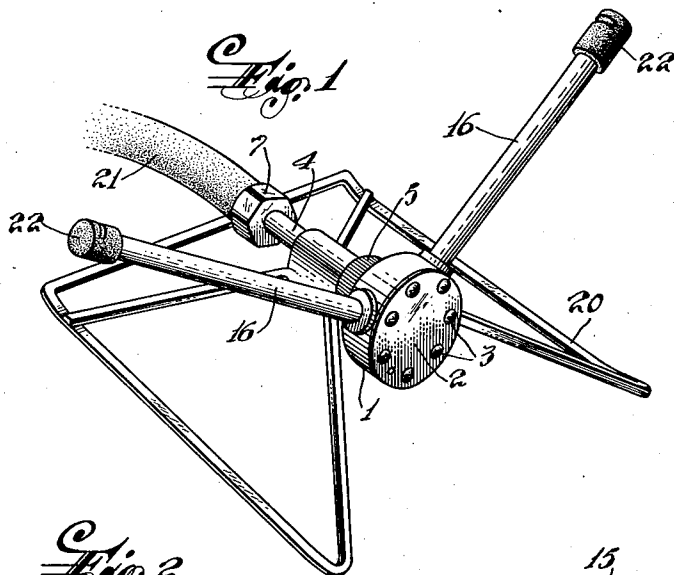
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2,564,639

LAWN SPRINKLER

Filed Aug. 30, 1946

3 Sheets-Sheet 1



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Fig. 9

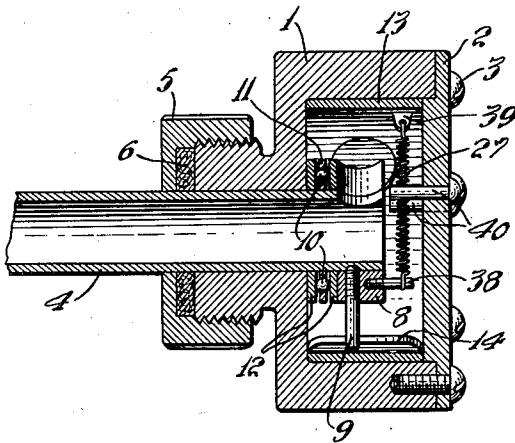


Fig. 10

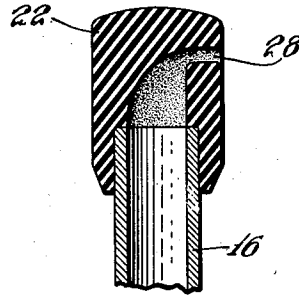


Fig. 11

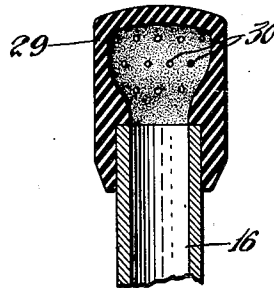


Fig. 12

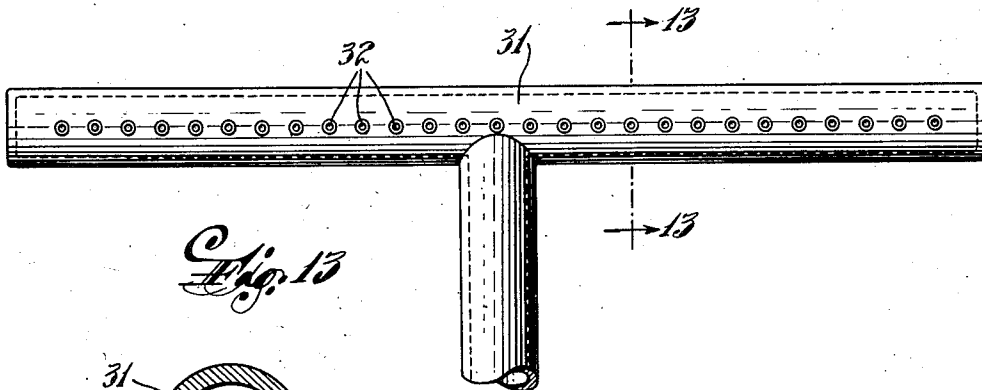
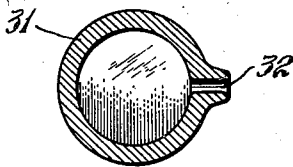


Fig. 13



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UNITED STATES PATENT OFFICE

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LAWN SPRINKLER

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2 Claims. (Cl. 299—71)

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This invention relates to lawn sprinklers and has, for its principal object, the distribution of a spray of water over a square or rectangular area, with the sprinkler in the center thereof.

Another object is to provide, in a sprinkler, a pair of arms extending from the center thereof with the ability to oscillate in a vertical plane under the reaction of the pressure by which water is alternately forced from the ends of such arms.

Still another object is to furnish a sprinkler head from which water is distributed in the form of a V-shaped spray.

A further object is to provide a sprinkler composed of a minimum number of simple parts, easy to adjust and maintain, and operable under low water pressures.

Other objects will appear in the description which follows.

Heretofore, most lawn sprinklers operated by the use of the pressure of the water flowing through them, have moving arms that travel in a horizontal plane, or in the plane of the surface of a cone, distributing water over a circular area or over a segment of a circular area.

Those that distribute water by casting it in a vertical plane accomplish their performance only with a number of complex, moving parts. None has succeeded in producing a practical device with distributor arms oscillating in a vertical plane solely by utilization of the reaction principle.

Our invention utilizes the reaction of the water emitting from the nozzles or sprinkler heads to cause a controlled oscillating movement of distributor arms in a vertical plane. It does this with a few, compactly nested simple parts enclosed so as to be free from external influences and unnecessary wear. To achieve positive action, even with relatively low water pressures, it incorporates an anti-friction element between the principal stationary and moving parts to assist in the smooth functioning of the device.

Our invention is illustrated in the accompanying drawings in which:

Figure 1 is an isometric view of our preferred form of sprinkler ready for operation,

Figure 2 is a side elevational section of our preferred construction, without the base or base-attaching means.

Figure 3 is a front elevational view of the valve casing of Figure 2, with cover plate removed.

Figure 4 is a front elevational view of an alternate valve casing and valve construction with cover plate removed.

Figure 5 is a front elevational view of another

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alternate valve casing and valve construction, with cover plate removed, showing employment of two valves tripped by appropriate projecting arms.

Figure 6 is a side elevational view of the casing and valve construction shown in Figure 5.

Figure 7 is a front elevational view, cover plate removed, of two valves linked in such a manner that alternate opening and closing is accomplished.

Figure 8 is a front elevational view of still another alternate valve casing and spring closed valve, with cover plate removed.

Figure 9 is a side elevational section of the casing and valve shown in Figure 8.

Figure 10 is a side elevational section of the sprayer head illustrated in Figure 1.

Figure 11 is a front elevational view of an alternate type of sprayer head.

Figure 12 is a front elevational view of a sprayer tube that can be used instead of the sprayer head shown in Figures 10 and 11.

Figure 13 is a cross-section of the tube illustrated in Figure 12.

Referring to the drawings in which similar numbers identify the same or similar parts throughout the various views, construction is as follows.

Referring to Figure 1, spindle 4, about which valve casing 1 oscillates, is supported upon a suitable base 20. The base shown is of the sled type to facilitate moving the sprinkler about, merely by pulling hose 21 which is connected with spindle 4 by female hose connection 7. Base 20 is made of sufficient weight and width to hold the sprinkler in position, even while it is under the influence of the oscillating motion of its moving parts. Arms 16 project from valve casing 1 and the action of water which flows out of sprinkler heads 22, through opening in such heads, which substantially face each other, imparts the oscillating movement.

Referring to Figures 2 and 3, it will be seen that spindle 4 projects through valve casing 1, the casing being rotatably secured thereto by stuffing nut 5, packing washer 6 and spindle sleeve 8. The open end of the piece which comprises valve casing 1 is closed by cover 2 and held thereon with cover screws 3. Within valve casing 1 is valve 13 which consists of a sleeve free to rotate with certain limitations within body 1. This valve has, in one portion of its periphery, a valve slot 15 which is of such length that when it permits free, uninterrupted passage of water from the interior of valve casing 1 to one arm

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16, it does not extend far enough to do so to the other arm 16. Opposite valve slot 15 are located stops 14 which are raised sufficiently above the interior surface of valve 13 to be engaged alternately with valve operating rod 9 as the valve moves. Valve operating rod 9 is a fixed rod projecting downward from the spindle sleeve 8. Surrounding the end of spindle 4 is spindle sleeve 8 which, in our construction, we have shown conveniently fixed to spindle 4 by means of valve operating rod 9, which is threaded to be engaged with spindle sleeve 8 and pass through the same and be engaged against the surface of spindle 4, thus firmly securing it.

Arms 16 may be attached in any manner, the illustration in Figure 3 showing them threaded to the valve casing and locked thereon by lock nuts 17.

The sprinkler operates when water passes out of the end of spindle 4 into the cavity of valve casing 1 and thence through valve slot 15 into and through arm 16 and thence out through sprinkler head 22. Upon leaving the opening of sprinkler head 22, the reaction of the water against the rear of such head causes arm 16 to move away from the direction in which the water is being sprayed. In so moving, it carries with it valve casing 1 and valve 13, until valve 13 is stopped in its motion by stop 14 striking the valve operating rod 9. With valve 13 motionless, valve casing 1 continues to move and in so doing closes the opening into the arm 16 through which the water was passing and positions valve slot 15 opposite the other arm 16. By thus alternately changing the flow of water from one arm to the other, the oscillating motion is produced and the sprinkler remains in continuous operation as long as water is supplied to it.

In our experiments, we have found that the introduction of water under pressure into devices of this kind tends to cause binding of the stationary and moving parts, due to the water pressure which tends to force the casing away from the spindle. Thus in the present construction water under pressure in the cavity of valve casing 1 causes some distortion and tends, with the usual attaching features, to bind casing 1 to spindle 4. To permit the use of relatively low water pressures by reducing the friction between the casing and spindle, we have introduced an anti-friction member, one form of which is shown in Figure 2, which consists of two washers 12 between which ball retaining ring 11 and three balls 10 are contained. The thrust of the water pressure against cover 2, with its resulting increase in friction, is thus minimized by interposing this anti-friction device between spindle sleeve 8 and the rear inner face of valve casing 1.

In order to provide for continuous operation, it is necessary to so position arms 16 that body 1 does not come to rest at any time on "dead" center. Utilizing the effect of gravity, it has been found that by separating these arms from 95 to 105° and properly positioning the valve elements that this condition can be avoided and the ports to arms 16 will never, in normal operation, be partially open at the same time.

Various types of valve construction may be employed, not only to secure refinements in operation but to accomplish the same results. Figure 4 shows another type in which sleeve 50 instead of as valve 8 as a sleeve in valve casing 1, as shown in Figures 2 and 3, is mounted on spindle 4. This sleeve alternately opens and closes the openings to arms 16 by means of valves

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19. The sleeve 50 moves about spindle 4 within the limit of motion prescribed by rod 23, projecting through slot 33 in such valve. When rod 23 stops and holds sleeve 50 motionless, continued movement of valve casing 1 closes seat 18 on valve 19 and seals off arm 16. Alternate passage of water from one arm 16 to another is thus provided in order to activate and keep the oscillation continuous.

In Figures 5 and 6, valves 24, designed to close the openings into arms 16, are provided on pins 25 which in turn are secured to valve casing 1. Fixed to spindle 4 are two stationary trip arms 26 and stationary vanes 34. In this construction the water does not issue only out of the end of spindle 4 but through the openings 55 in its sides. Attached to cover 2 is damping member 51 that sweeps through the arc limited by vanes 34 as the valve casing oscillates. A throttled opening 53 is provided in member 51 to regulate the passage of water through it.

Valves 24 are alternately opened and closed as they are carried past trip arm 26 or against vane 34. Spring clips 56 hold valves 24 in an open position until vane 34 contacts the outer leaf of the valve and closes it. Water which is pocketed in the lower portion of valve casing 1 between vanes 34 dampens the oscillation of the valve casing by retarding the movement of damping member 51 through it. Slots 52 in the inner surface of casing 1 are sized and spaced to control the damping effect at various stages in the oscillation cycle. Adjusting screw 57 in damping member 51 permits adjustment of the size of opening 53.

Figure 7 discloses a linkage system for alternately opening and closing the opening into arms 16. Valves 35 are pivoted on pins 25 secured to valve casing 1. Also attached to this casing is gear segment 36 meshing with gear teeth 37 of valves 25. Stops 38 affixed to spindle 4 not only limit the movement of valve casing 1 but partially rotate gear segment 36 and simultaneously close one port and open the other.

A damping effect is secured by construction similar to that shown in Figures 5 and 6. Figures 8 and 9 illustrate a type of spring activated valve construction. It is recognized where it is not desired to position the arms to avoid a "dead center" condition, or where use of the sprinkler on sloping ground is intended, that positive means must be provided to prevent the stoppage of the parts so that a partial opening into both arms 16, exists at the same time. We have employed a spring to be used in conjunction with our basic principle to give such positive means.

In Figures 8 and 9, coiled spring 27 is anchored to spindle sleeve 8 by pins 38 and to valve 13 by pin 39, and lies between studs 40 which project through cover 2. The valve mechanism acts as described for the construction shown in Figures 2 and 3, but as the valve casing 1 approaches the limit of movement in either direction the spring is elongated and put under tension. When valve 13 is stopped by striking valve operating rod 9, the energy built up in spring 27 acts on valve 13 to reverse its movement and quickly shut off the opening to arm 16.

Sprinkler head 22, shown in Figure 10, permits water to emerge in the form of a spray through slotted bell-mouthed opening 28. The shape of the opening determines the width and breadth of the spray.

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An alternate type of sprinkler head is one shown in Figure 11 in which sprinkler head 29 is perforated with holes 30 which may be disposed to give the desired spray of substantially uniform density.

Instead of a sprinkler head, it is also possible to use a sprayer tube 31 as shown in Figure 12. In the use of such a sprayer tube, holes 31 must be positioned and sized so as to furnish a spray of uniform density. These holes near the extremities of the tube are of larger diameter than those nearer the center, in order to compensate for the pressure drop along the length of the sprayer tube. By shaping the sprayer tube, as best shown in Figure 13, the holes 32 will have sufficient depth to impart direction to the stream of water issuing therefrom.

It is apparent that many modifications of our invention may be made. The foregoing description is intended to be illustrative only, and in no way limiting upon the scope of our invention.

What we claim is:

1. A sprinkler comprising, a hollow open ended spindle supported horizontally and projecting into a rotatable valve casing, said valve casing opening into hollow radial arms projecting therefrom in a substantially vertical plane and at an angle of from 95 to 105 degrees to each other, members affixed to the ends of said arms with outlets facing to each other, valve members interposed between said spindle and valve casing operable by the reaction of water emitting from the spray member to alternately open and close the entrance ports into said hollow radial arms, and

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anti-friction means disposed in a vertical plane between opposing bearing surfaces of the spindle and the valve casing.

2. In a lawn sprinkler a water reaction direction reversing valve mechanism comprising a hollow, horizontal spindle opening into a valve casing rotatably mounted thereon, ports in said valve casing connecting with hollow radial arms, valve members interposed between the spindle and the valve casing, means for alternately opening and closing said ports according as the valve casing is in one or the other of two positions, and a restrained spring, connecting the fixed with the moving parts, adapted to accelerate the reversal of direction of the movable valve members.

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