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ROTATING SPRINKLER

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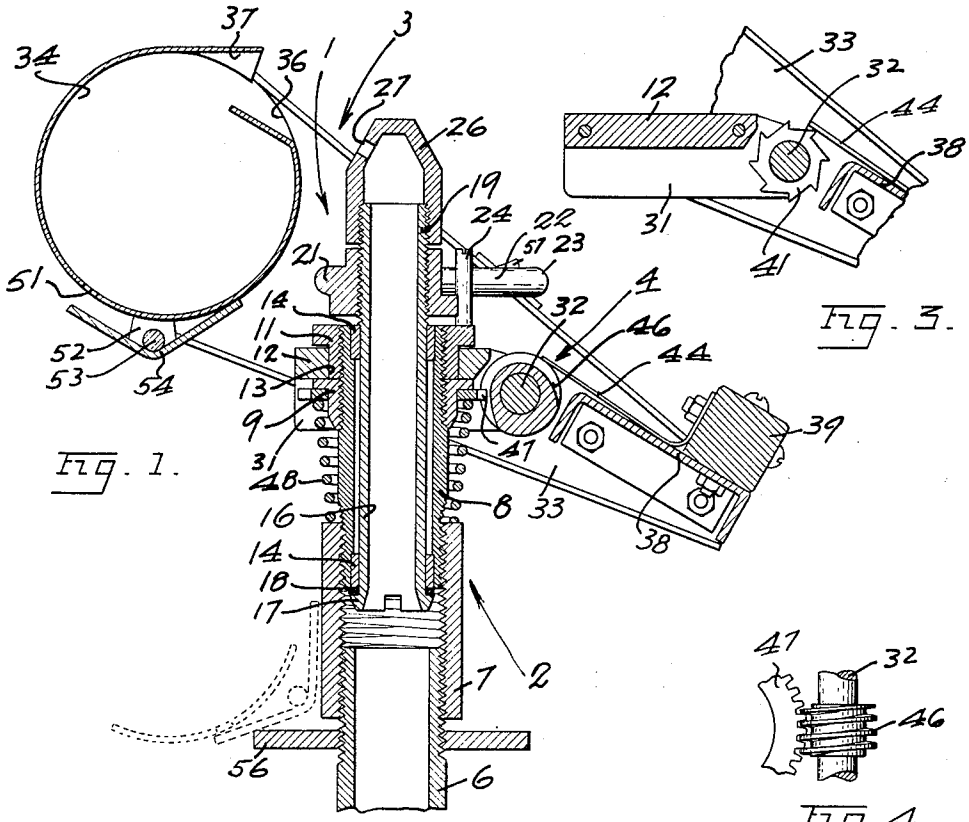


Fig. 1.

Fig. 3.

Fig. 4.

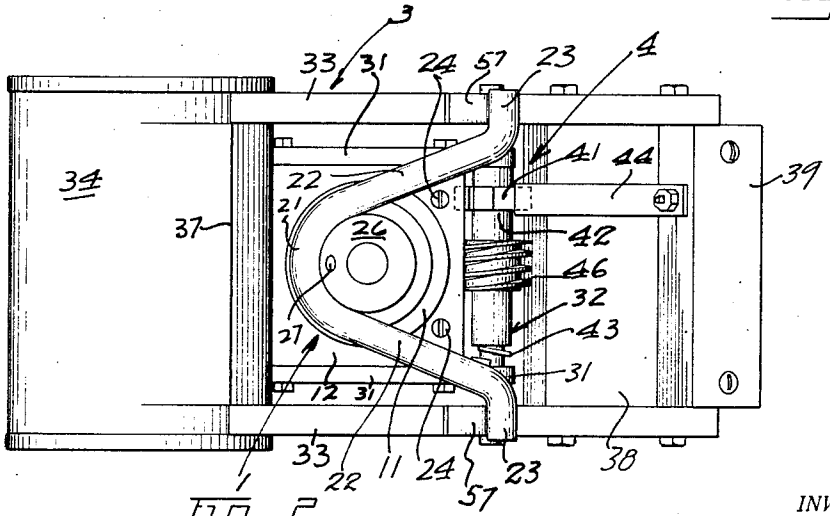


Fig. 2.

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ROTATING SPRINKLER

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7 Claims. (Cl. 299—64)

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This invention relates to a rotating sprinkler.

An object of this invention is to provide a sprinkler which is capable of comparatively slow intermittent rotary motion, for instance one revolution in an hour, for the irrigation of orchards or other cultures, where it is desirable to apply the water on any portion of the surface only at intervals for better penetration into the soil, thereby lessening puddling or the trapping of air in the soil, and thereby avoiding the constant wetting of the lower branches of trees, and thus preventing the spread of fungus or other diseases or the splitting of fruit.

Particularly an object of this invention is to provide a sprinkler in which the rotation of the sprinkler is accomplished intermittently by a rocking mechanism operated by the alternate filling and emptying of a container on said rocking mechanism automatically.

I am aware that some changes may be made in the general arrangements and combinations of the several devices and parts, as well as in the details of the construction thereof without departing from the scope of the present invention as set forth in the following specification, and as defined in the following claims; hence I do not limit my invention to the exact arrangements and combinations of the said device and parts as described in the said specification, nor do I confine myself to the exact details of the construction of the said parts as illustrated in the accompanying drawings.

With the foregoing and other objects in view, which will be made manifest in the following detailed description, reference is had to the accompanying drawings of the illustrative embodiment of the invention, wherein:

Fig. 1 is a sectional view of a rotating sprinkler constructed in accordance with my invention.

Fig. 2 is a top plane view of said rotating sprinkler.

Fig. 3 is a sectional detail view of the ratchet mechanism through which the rocking motion is converted into rotation of the sprinkler, and

Fig. 4 is a fragmental detail view of the transmission from the ratchet operated shaft to the nozzle structure.

In its general organization my invention, in its illustrative embodiment, includes a rotatable nozzle unit 1 supported on a relatively stationary conduit unit 2, a rocking or oscillating unit 3 which is oscillating on a horizontal axis and is actuated by the action of gravity on a varying volume of water issuing from the nozzle, and a transmission mechanism 4 to convert the oscillating or rocking motion of the unit 3 into rotary motion of the nozzle unit 1.

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The stationary unit 2 includes a pipe 6 on the top of which is a threaded collar 7 to which is connected a coupling 8.

Inside of the coupling 8 are a pair of spaced bearing bushings 14 in which latter is rotatably held a nozzle tube 16, which is the supporting member of the nozzle unit 1. The lower end of the nozzle tube 16 has an outwardly enlarged head 17. On the tube 16 and against this head is a fiber washer 18 which bears against a seat formed by the lower bushing 14, so that under water pressure the washer 18 seals the space around the tube 16. The outer end 19 of the tube 16 is externally threaded and is provided with a collar 21 fixed on the threaded portion of the tube 16. A pair of diverging arms 22 extend from the collar 21 toward and above the transmission mechanism 4. The outer end of each arm 22 terminates in an outwardly extending abutment tip 23.

A nozzle tip 26 is provided on the outer end of the threaded end 19 of the tube 16. The nozzle tip 26 has a side orifice 27 which discharges a stream of water upwardly and laterally with respect to the axis of the tube 16. The outlet orifice 27 faces in the direction generally opposite to the space between the diverging arms 22 of the collar 21.

Near the upper end of the externally threaded coupling 8 are spaced bearing bushings 9 and 11 the heads or top flanges of which form seats for a horizontal plate 12 the central hole 13 of which is journalled on the body of the upper bushing 11. Said plate 12 is rotatably supported between the top flanges of the bushings 9 and 11. A pair of spaced pins 24 extend upwardly from the plate 12 in the vicinity of the respective arms 22.

As the plate 12 is moved by the transmission mechanism 4 the respective pin 24 abuts against the adjacent arm 22 and thereby turns the collar 21 and the tube 16 therewith. In this manner the nozzle orifice 27 is shifted angularly.

The intermittent shifting of the direction of the nozzle orifice 27 is accomplished by the oscillating or rocking mechanism 3. The horizontal plate 12 has a pair of spaced brackets 31 extended from opposite sides thereof, generally in the same direction as and under the diverging arms 22. In the brackets 31 is journalled a pivot shaft 32. On the ends of the pivot shaft 32 are supported a pair of spaced lever arms 33. On the ends of the lever arms 33 adjacent and beyond the nozzle orifice 27, is supported a generally cylindrical

container 34 extended transversely between said ends of the lever arms 33. At the top of the container 34 is provided a transverse slit opening 36 on the upper edge of which is provided a deflector 37 so that when said container 34 is in its extreme upward position, the deflector 37 intercepts the stream of water issuing from the nozzle orifice 27 and directs said water into the container 34 for filling said container rapidly.

Between the other ends of the lever arms 33 is mounted a cross plate 38. On this cross plate 38 is mounted a counterweight 39, which counterbalances the container 34 in such a way that the container 34 is filled with water before the center of gravity of the oscillating or rocking device shifts from the side of the pivot shaft 32 nearer the counterweight 39 to the other side, for lowering the container 34 into the position indicated in dotted lines in Fig. 1.

The transmission 4 includes a ratchet 41 fixed on an enlarged portion 42 of the pivot shaft 32. A spring washer 43 between one of the brackets 31 and the shoulder of said enlarged portion 42 holds the other shoulder against the other bracket 31 with sufficient friction to prevent the rotation of the shaft 32 except when the ratchet 41 is rotated. Rotation is imparted to the ratchet 41 by a spring pawl 44 which extends from the weight 39. As the container 34 is filled with water and moves to the extreme down position, the rocking of the lever arms 33 and the turning of the counterweight 39 upwardly about the pivot axis urges the spring pawl 44 against the adjacent tooth of the ratchet wheel 41 so as to turn the latter and thereby to turn the pivot shaft 32. A worm 46 fixed on the pivot shaft 32 rides on a ring gear 47. This ring gear 47 is positioned under the head of the lower bushing 9 on the coupling 8. A firm coil spring 48 between the top of the threaded collar 7 and the ring gear 47 holds the ring gear 47 stationary with respect to the adjacent bushing 9. As the worm 46 is turned with the pivot shaft 32, it rides around the ring gear 47 and thereby turns the plate 12. The pin 24 engages the adjacent diverging arm 22 of the fixed collar 21 so as to rotate the nozzle tube 16 and the nozzle 26 therewith to the same extent angularly as the oscillating or rocking unit 3 is carried around the ring gear 47 by the pivot shaft 32.

On the lower portion of container 34 is an outlet orifice 51 which is comparatively small so that it does not allow the outflow of the water from the container 34 fast enough to prevent the rapid filling of said container 34. Adjacent the outlet orifice 51 are provided a pair of suitable bearing ears 52 in which is journalled the pivot 53 of a butterfly valve 54. The outer flap of the butterfly valve 54 in the lowermost position of the container 34 as indicated in broken lines in Fig. 1, is engaged by a fixed plate 56 on the conduit 6, and is urged thereby toward the orifice 51 so as to partially cover said orifice 51 and thereby to control the rate of outflow from the container 34. During a period of time needed for the emptying of the water from the container 34, the stream from the nozzle 27 freely sprinkles upon the ground in the adjusted direction. After the container 34 has emptied sufficiently so that the center of gravity shifts to the side between the pivot shaft 32 and the counterweight 39, said counterweight 39 lifts the container 34 back to the initial extreme upward position where the container 34 is rapidly filled again for the swing to the downward position and for the next rotation of the nozzle assembly to another angular position. The nozzle assembly remains in said adjusted position throughout the period determined by the time needed for the emptying of the container 34. This period of time is predetermined by the relative position of the butterfly valve 54 to the outflow orifice 51, which can be adjusted by suitably raising or lowering the plate 56.

Said period of time can also be predetermined differently for different angular positions of the sprinkler by bending a portion or portions of the rim of the plate 56 so that its effect on the position of the butterfly valve is different for different angular positions of the sprinkler.

The pivot shaft 32 and the worm 41 are rotated by the oscillation or rocking of said oscillating unit 3 in one direction intermittently, and as the worm 41 meshes with the ring gear 47, the worm and the entire nozzle and rocking unit will turn around this gear 47, giving the entire assembly a slow intermittent rotation.

On the top of each lever arm 33 is provided a projection or lug 57 which abuts the adjacent tip 23 of the diverging arm 22 upon each return of the rocking unit 3 to the initial position shown in full lines in Fig. 1. In this manner the unit is always correctly aligned and centered with respect to the lower plate 12 for the next operation. For the purpose of the centering or aligning, the pins 24 are somewhat spaced from the adjacent diverging arms 22, to allow for this alignment action. Thus the inertia of the oscillating unit 3 is utilized to overcome the resistance offered by the friction under water pressure of the washer 18 on the bushing 14 and to align the diverging arms 22 with the pins 24 of the lower plate 12. This aligns the nozzle orifice 27 with the slit 36 of the container 34.

I claim:

1. In a sprinkling device, a relatively stationary connection to a conduit, a sprinkling nozzle rotatably mounted in said connection, a device rotatable around said connection, oscillating arms pivoted on said device on a pivot axis generally at right angle to the axis of said nozzle, a hollow container on one end of said arms to receive the water from said sprinkling nozzle in one extreme position and to rock said device to another extreme position by gravity when filled with water and to remain in said second extreme position until substantially emptied, a drain outlet on said container, a drain obstruction element adjustably supported on said container near said outlet, an abutment element on said conduit in path of said obstruction element to be abutted thereby when the filled container is lowered into its said second extreme position thereby to regulate the rate of emptying of said container, and means to rotate said nozzle and said oscillating units around said connection every time said container is oscillated.

2. In a sprinkling device, a relatively stationary conduit, a nozzle journalled in the end of said conduit, an element supported on said conduit rotatably about the axis of the conduit, coacting members on said element and on said nozzle to transmit rotation from said element to said nozzle, a rocking frame journalled on said element on an axis generally transverse to the conduit, a hollow container on the side of the rocking frame opposite said nozzle, an intake on said container intercepting the stream from said nozzle for filling said container, a

counterbalance on the other side of the container to normally locate the center of gravity of said rocking frame between the journal axis of the rocking frame and said counterbalance so that said center of gravity is shifted over said frame journal axis to the side between said axis and said container as said container is filled and said container is lowered by the gravity of the liquid therein, an outlet on the container draining liquid from said container at a rate slower than the rate of intercepted flow from said nozzle so as to cause the return of said center of gravity toward said counterbalance for raising said container to said intercepting position, and a device for converting the rocking motion of said frame into rotation of said frame and of said element about said conduit for intermittently turning said nozzle about said axis of said conduit.

3. In a sprinkler, a conduit, a nozzle journalled axially in the end of said conduit and having a generally laterally discharging nozzle orifice, a bracket journalled on said conduit about an axis generally coinciding with the journal axis of said nozzle, a transverse pivot shaft journalled in said bracket, a rocking frame journalled on said shaft, a container on one end of said rocking frame having an intake in the path of the stream issuing from said nozzle orifice in one extreme position of said container, a counterbalance at the other side of said frame arranged to locate the center of gravity of said frame between said shaft and said counterbalance until said container is filled, said center of gravity being shifted toward said container as the container is filled to lower said filled container, a worm on said shaft, a relatively stationary gear on said conduit, said worm riding on said gear when said worm is rotated to move said frame and said bracket about the axis of said conduit, a device to rotate said worm every time said frame is rocked to lower said container, connecting means between said bracket and said nozzle to move said nozzle about its journal axis with said worm and said frame, and a discharge from said container to drain the liquid from said container at a predetermined rate slower than the rate of the stream flow into said container so as to empty said container in its lowered position and thereby cause the shifting of said center of gravity back toward said counterbalance for returning the container into the path of the nozzle stream for refilling.

4. In a sprinkling device, a relatively stationary conduit, a nozzle journalled in the end of said conduit, an element supported on said conduit rotatably about the axis of the conduit, coacting members on said element and on said nozzle to transmit rotation from said element to said nozzle, a rocking frame journalled on said element on an axis generally transverse to the conduit, a hollow container on the side of the rocking frame opposite said nozzle, an intake on said container intercepting the stream from said nozzle for filling said container, a counterbalance on the other side of the container to normally locate the center of gravity of said rocking frame between the journal axis of the rocking frame and said counterbalance so that said center of gravity is shifted over said frame journal axis to the side between said axis and said container as said container is filled and said container is lowered by the gravity of the liquid thereon, an outlet on the container draining liquid from said container at a rate slower than the rate of intercepted flow from said nozzle so as to cause the return of said center of gravity toward said counterbalance for raising said container to said intercepting position, and a device for converting the rocking motion of said frame into rotation of said frame and of said element about said conduit for intermittently turning said nozzle about said axis of said conduit, said last mentioned device including a gear around said conduit, a worm riding on said gear, a ratchet wheel for rotating said worm, a ratchet pawl on the frame engaging the ratchet wheel for turning it as the frame is rocked by the lowering of the container thereby causing said worm to ride around said gear, and an element connecting said worm and said frame together for simultaneous movement around said gear and conduit.

5. In a sprinkling device, a relatively stationary conduit, a nozzle journalled in the end of said conduit, an element supported on said conduit rotatably about the axis of the conduit, coacting members on said element and on said nozzle to transmit rotation from said element to said nozzle, a rocking frame journalled on said element on an axis generally transverse to the conduit, a hollow container on the side of the rocking frame opposite said nozzle, an intake on said container intercepting the stream from said nozzle for filling said container, a counterbalance on the other side of the container to normally locate the center of gravity of said rocking frame between the journal axis of the rocking frame and said counterbalance so that said center of gravity is shifted over said frame journal axis to the side between said axis and said container as said container is filled and said container is lowered by the gravity of the liquid thereon, an outlet on the container draining liquid from said container at a rate slower than the rate of intercepted flow from said nozzle so as to cause the return of said center of gravity toward said counterbalance for raising said container to said intercepting position, and a device for converting the rocking motion of said frame into rotation of said frame and of said element about said conduit for intermittently turning said nozzle about said axis of said conduit, said coacting members including a pair of arms extended from said nozzle and diverging in a direction away from said container, and a pair of spaced abutments extended from said element and between said arms to abut the respective arms for transmitting turning movement thereto.

6. In a sprinkling device, a relatively stationary conduit, a nozzle journalled in the end of said conduit, an element supported on said conduit rotatably about the axis of the conduit, coacting members on said element and on said nozzle to transmit rotation from said element to said nozzle, a rocking frame journalled on said element on an axis generally transverse to the conduit, a hollow container on the side of the rocking frame opposite said nozzle, an intake on said container intercepting the stream from said nozzle for filling said container, a counter balance on the other side of the container to normally locate the center of gravity of said rocking frame between the journal axis of the rocking frame and said counterbalance so that said center of gravity is shifted over said frame journal axis to the side between said axis and said container as said container is filled and said

container is lowered by the gravity of the liquid thereon, an outlet on the container draining liquid from said container at a rate slower than the rate of intercepted flow from said nozzle so as to cause the return of said center of gravity toward said counterbalance for raising said container to said intercepting position, and a device for converting the rocking motion of said frame into rotation of said frame and of said element about said conduit for intermittently turning said nozzle about said axis of said conduit, said coacting members including a pair of arms extended from said nozzle and diverging in a direction away from said container, and a pair of spaced abutments extended from said element and between said arms to abut the respective arms for transmitting turning movement thereto, an outward tip on each arm extended over said frame, and an abutment ear on the frame between each tip and said container for abutting the respective tips upon the return of the emptied container to said intercepting position in the path of said nozzle stream for turning said nozzle in the respective direction and centering it with respect to said frame.

7. In a sprinkling device, a relatively stationary conduit, a nozzle journalled in the end of said conduit, an element supported on said conduit rotatably about the axis of the conduit, coacting members on said element and on said nozzle to transmit rotation from said element to said nozzle, a rocking frame journalled on said element on an axis generally transverse to the conduit, a hollow container on the side of the rocking frame opposite said nozzle, an intake on said container intercepting the stream from said nozzle for filling said container, a counter balance on the other side of the container to normally locate the center of gravity of said rocking frame between the journal axis of the rocking frame and said counter balance so that said center of gravity is shifted over said frame journal axis to the side between said axis and said

container as said container is filled and said container is lowered by the gravity of the liquid thereon, an outlet on the container draining liquid from said container at a rate slower than the rate of intercepted flow from said nozzle so as to cause the return of said center of gravity toward said counterbalance for raising said container to said intercepting position, and a device for converting the rocking motion of said frame into rotation of said frame and of said element about said conduit for intermittently turning said nozzle about said axis of said conduit, said last mentioned device including a gear around said conduit, a worm riding on said gear, a ratchet wheel for rotating said worm, a ratchet pawl on the frame engaging the ratchet wheel for turning it as the frame is rocked by the lowering of the container thereby causing said worm to ride around said gear, and an element connecting said worm and said frame together for simultaneous movement around said gear and conduit, said coacting members including a pair of arms extended from said nozzle and diverging in a direction away from said container, and a pair of spaced abutments extended from said element and between said arms to abut the respective arms for transmitting turning movement thereto.

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