May 20, 1958 W. D. EGLY ET AL 2,835,529

PATTERN TYPE LAWN SPRINKLER

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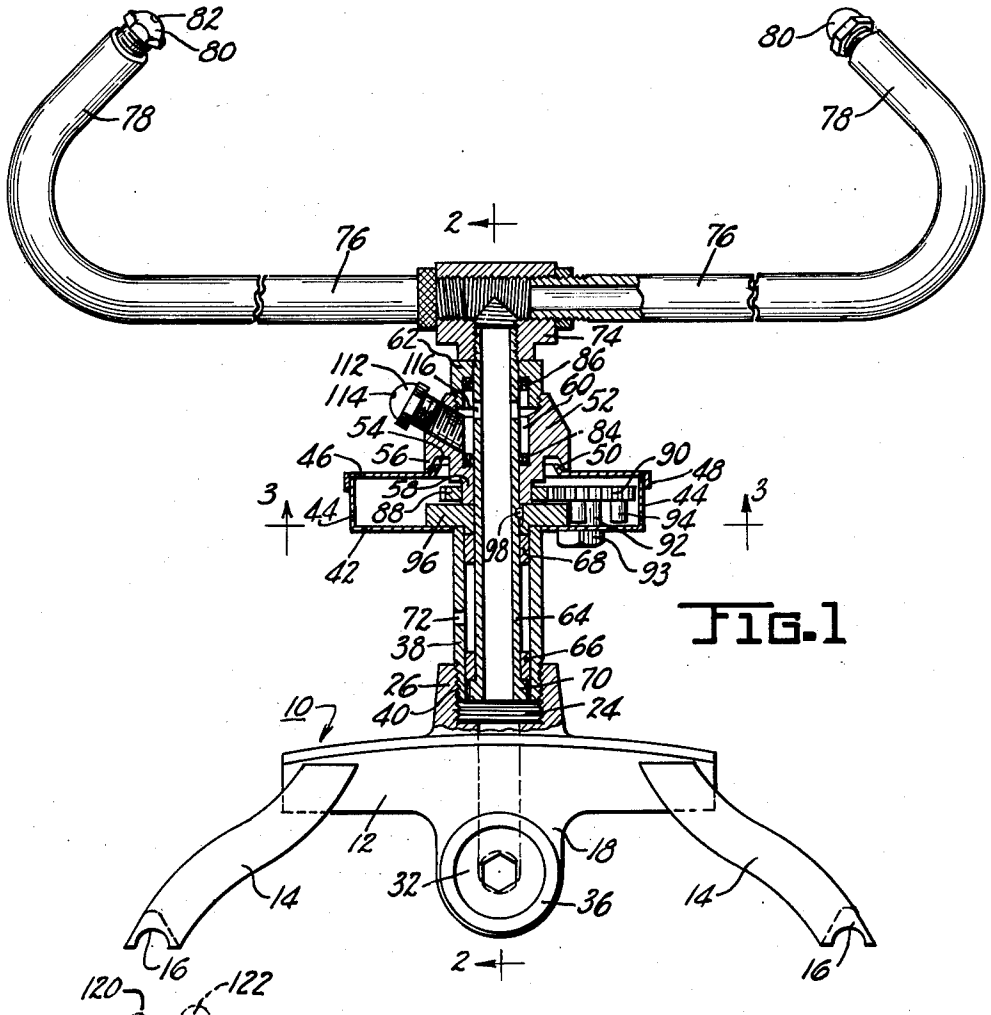


FIG. 1

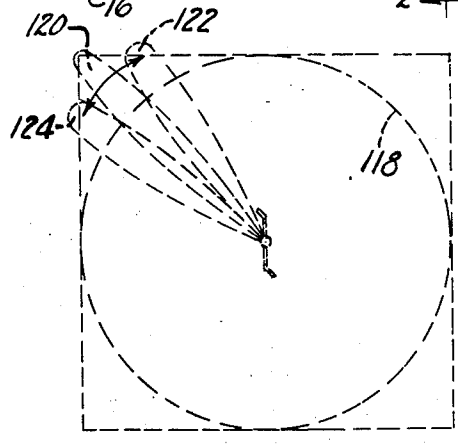


FIG. 7

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PATTERN TYPE LAWN SPRINKLER

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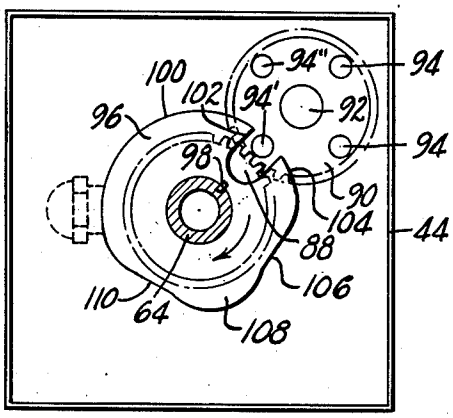


FIG. 3

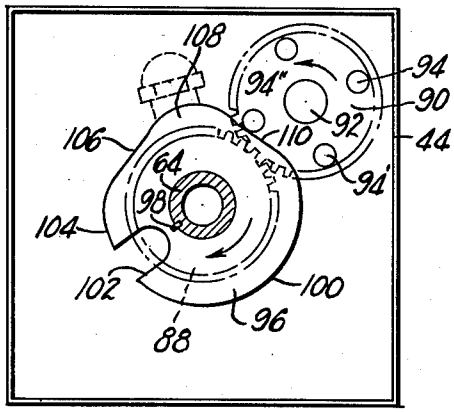


FIG. 4

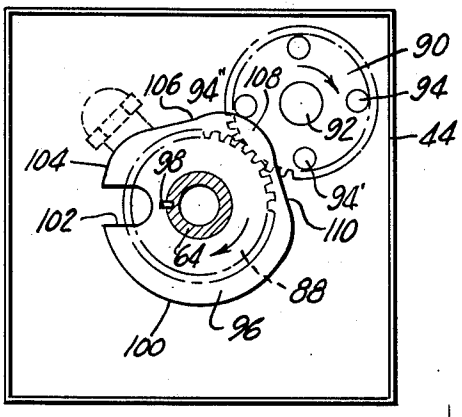


FIG. 5

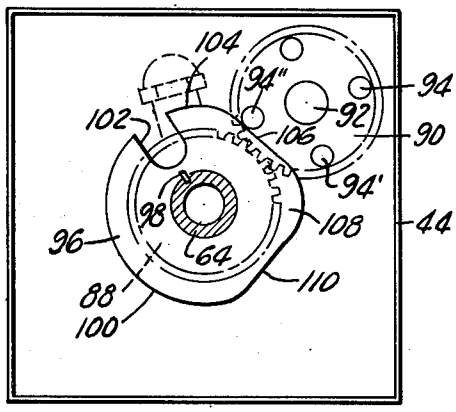


FIG. 6

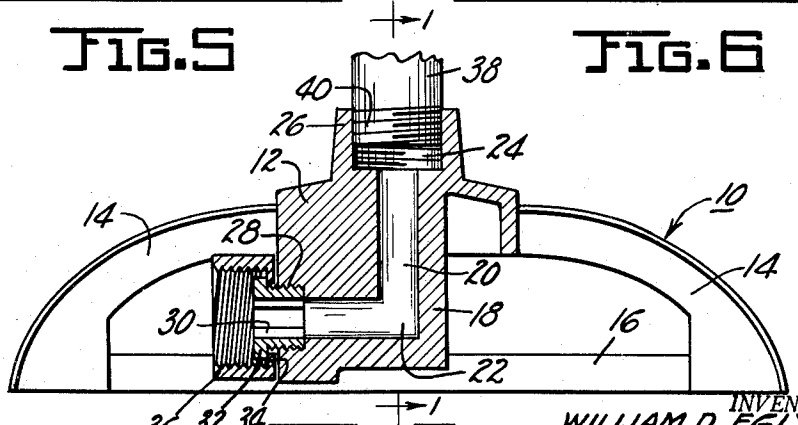


FIG. 2

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PATTERN TYPE LAWN SPRINKLER

Filed July 19, 1954 3 Sheets-Sheet 3

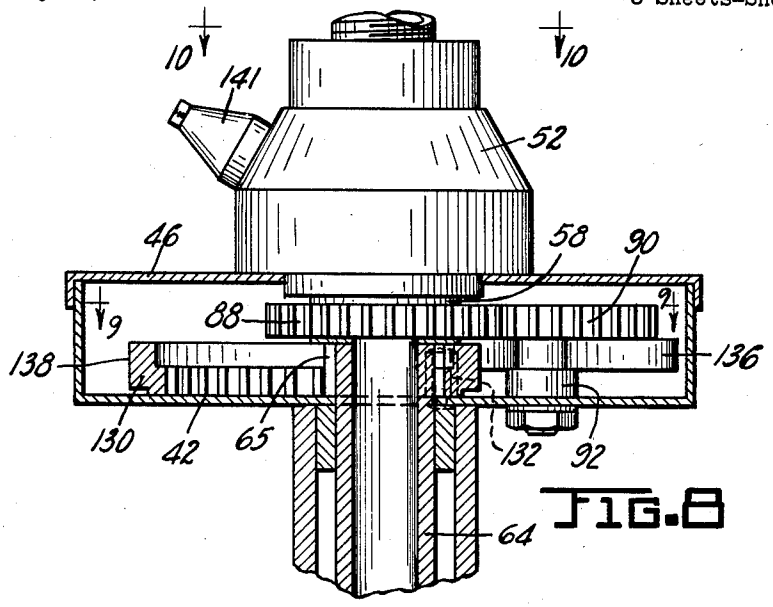


FIG. 8

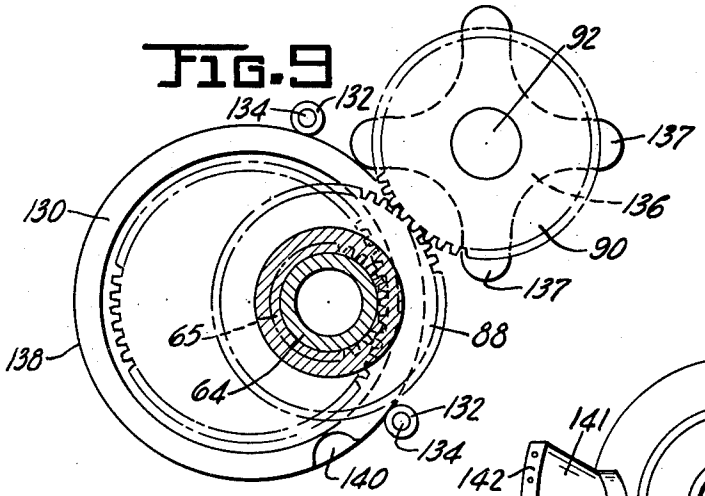


FIG. 9

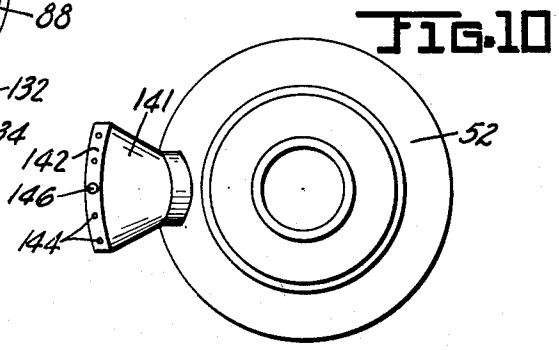


FIG. 10

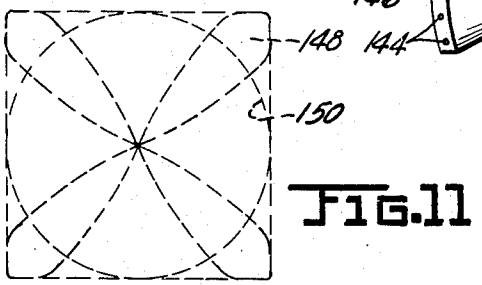


FIG. 11

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2,835,529

# PATTERN TYPE LAWN SPRINKLER

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Application July 19, 1954, Serial No. 444,062

12 Claims. (Cl. 299—18)

This invention relates to improvements in lawn sprinklers.

The primary object of this invention is to provide a lawn sprinkler capable of sprinkling a square area or other polygonal shaped area with a substantially uniform concentration of water discharge at all points within the area.

A further object is to provide a lawn sprinkler having a rotatable water reaction sprinkler for sprinkling a circular area, and a nozzle capable of discharging a stream of water a greater distance than the first named rotatable sprinkler unit, and periodically shifted through a predetermined angular displacement by means actuated by the rotating sprinkler unit.

A further object is to provide a lawn sprinkler having a rotatable water reaction sprinkler and a secondary discharge nozzle and a means responsive to the rotation of the first named sprinkler head for shifting said second nozzle successively to angularly displaced position and for oscillating said secondary head in each of said positions.

A further object is to provide a device of this character having a rotatable water reaction sprinkler head and a secondary sprinkler head mounted on a rotatable fitting and actuated by mechanism having a driving connection with the rotatable water reaction head and including a cam of irregular contour engageable by a follower having a driving connection with a nozzle mounting fitting so as to oscillate said fitting and the nozzle carried thereby, said cam and cam follower also having a pin and notch driving connection for rocking said cam follower through a predetermined angle upon each engagement of said pin and slot incident to each full revolution of the cam.

Other objects will be apparent from the following specification.

In the drawing:

Fig. 1 is a side view of the sprinkler with parts shown in section taken on line 1—1 of Fig. 2;

Fig. 2 is an enlarged fragmentary sectional view taken on line 2—2 of Fig. 1;

Fig. 3 is a transverse horizontal sectional view taken on line 3—3 of Fig. 1, and illustrating the parts in one operative position;

Fig. 4 is a view similar to Fig. 3, illustrating the parts in a second operative position;

Fig. 5 is a view similar to Fig. 3, illustrating the parts in still another operative position;

Fig. 6 is a view similar to Fig. 3 illustrating the parts in another operative position;

Fig. 7 is a schematic view illustrating the manner in which the device operates to sprinkle a square area;

Fig. 8 is an enlarged fragmentary detail view illustrating a modified embodiment of the invention, and with parts shown in section;

Fig. 9 is a sectional view taken on line 9—9 of Fig. 8;

Fig. 10 is a sectional view taken on line 10—10 of Fig. 8; and

Fig. 11 is a schematic view showing the sprinkling pattern of the embodiment of the sprinkler shown in Figs. 8, 9 and 10.



Referring to the drawings which illustrate the preferred embodiment of the invention, and particularly to Figs. 1 to 7, the numeral 10 designates a base having a frame or housing portion 12 supported by legs 14 extending downwardly and outwardly in divergent relation from the frame 10 and preferably connected together in pairs by runner portions 16. The frame portion 12 has a central downward projection 18 provided with a substantially L-shaped bore having a portion 20 extending upright and a lower portion 22. The upper end of the bore 20 communicates with a screw-threaded socket 24 defined in an upwardly projecting collar portion 26. The bore portion 22 communicates with a screw-threaded enlarged socket 28 receiving a tubular fitting 30 having an enlarged flanged outer end portion 32 serving to position the inwardly flanged annular end 34 of an internally screw-threaded coupling collar 36 adapted for connection with a water supply conduit or hose at a screw fitting on the end of that hose.

A tube 38 has a lower screw-threaded end portion 40 which is threaded in the bore 24 of the collar 26 of the base and extends upwardly therefrom. At its upper end the tube 38 mounts a casing having a base 42, side walls 44, and a top 46. The top 46 is preferably removably mounted on the side walls and may include a flange 48 fitting around the side walls. The top 46 has a central opening defined by a substantially upturned flange 50, here illustrated as a substantially frusto conical flange.

A fitting 52 has a large diameter upper end portion defined by an undercut annular groove 54 providing a marginal flange or shoulder 56 which bears against the top 46 around the flange 50. A reduced tubular neck portion 58 projects into the casing 42—46. The upper portion 52 of the fitting has a bore 60 of a diameter greater than the bore of the reduced tubular portion 58 of the fitting, and this enlarged bore portion 60 communicates with a mouth having an internal screw-thread to receive and be connected to a substantially cup-shaped fitting 62, in inverted position and having a central bore therethrough of substantially the same diameter as the bore of the reduced neck portion 58 of the fitting 52.

A water column tube 64 fits in the member 38 with clearance and has an outer diameter to fit snugly in the bore of the tubular portion 58 of the fitting 52 and the bore at the upper end of the fitting 62. The tube 38 has a bearing ring 66 in the lower end portion thereof and a similar bearing ring 68 adjacent its upper end, and these bearings serve to position the tube 64 concentrically in the tube 38. The tube 64 has an enlarged annular flange 70 at its lower end which bears against the lower end of the lower bearing 66 and normally provides a substantially sealed rotatable connection of the tube 64 with the base. A port 72 is preferably formed in the tube 38 between the bearings 66 and 68 to accommodate discharge of any water which might leak past the seal defined by the engagement of the flange 70 with the lower bearing 66.

The upper end of the tube 64 is externally screw-threaded to mount a T-fitting 74 or a head having two or more radial bores communicating with a vertical bore communicating with the upper end of the tube 64. Laterally extending tubular members 76 communicate with the radial bores of the head 74 and are provided with water discharge outlets. In the form shown the members 76 constitute elongated tubes having bent end portions 78 in the ends of which are mounted nozzle members 80 having discharge apertures 82. The arms 76 are so positioned that the water will be discharged therefrom angularly, laterally and upwardly so as to produce a water reaction resulting in rotation of the arms

76 incident to the discharge of water therethrough, and such rotation will be transmitted from the arms 76 through the head 74 to the tube 64 to cause the tube 64 to rotate relative to the base 10, the tube 38, the casing 42, 46, and the fittings 52 and 62.

An annular resilient seal 84 fits in the enlarged upper bore portion 60 of the fitting 52 at the shoulder defined by the lower end of the bore 60. A second annular resilient sealing member 86 is mounted in the inverted cup-shaped fitting 62 at the upper end of the socket or cavity within said fitting. Each of the members 84 and 86 preferably is formed of rubber or synthetic rubber, and they may be members such as O-rings, although members of substantially U-shape cross-section, as shown, are preferred, with the mouths of such U-shaped members facing each other so that water under pressure located therebetween will serve to spread the sealing members into effective sealing engagement with the tube 64 and with the respective fittings 52 and 62, so as to prevent the leakage of liquid between the tube 64 and the fittings 52 and 62, respectively.

The reduced tubular end portion 58 of the fitting 52 fixedly mounts thereon a gear 88. The gear 88 meshes with a gear 90 rotatable on a stud shaft 92 fixedly carried by the base 42 of the casing by means of a nut 93. The gear 90 has a plurality of pins or lugs 94 projecting therefrom and preferably located in equispaced relation to the axis of the gear and equispaced with relation to each other. Four lugs 94 are preferably provided, as in a case where the sprinkler is designed to sprinkle a square area. It will be understood, however, that a number of pins 94 employed is optional, although where the number is different than four, the same requirements for location of each of said pins substantially equally spaced from the center axis of the gear 90 and substantially equally spaced from each other exist.

A cam 96 is mounted upon the tube 64 and is fixedly anchored thereto as by means of a spline or key 98. The cam 96 preferably constitutes a substantially flat plate or disk-like member having a substantially uniform thickness and having a portion 100 of its periphery, here illustrated as slightly less than 180 degrees in extent, of circular outline concentric with the axis of the cam. The radius of the portion 100 in relation to the spacing of the axes of the tube 64 and the stud shaft 92 and in relation to the spacing of the lugs 94 from the axis of the shaft 92, is preferably such as to provide a slight rotative clearance between the cam and the two adjacent lugs 94 located on opposite sides of a line connecting the axes of the tube 64 and of the stud shaft 92. Assuming that the tube 64 and the cam 96 travel in a direction of the arrow in Fig. 3, the outline of the periphery of the cam 96 in a rotational direction from the leading end of the arcuate peripheral portion 100 of the cam will be as follows: A substantially radial groove 102 is provided of a width greater than the width of the lugs 94 and of such a depth that when a lug 94' seats therein, as illustrated in Fig. 3, the depth of the groove 102 will fully accommodate it without binding in a radial direction. Continuing in a rotational direction from the notch or recess 102, the periphery of the cam includes a portion 104 forming substantially a continuation of the arcuate surface 100, or of slightly greater radius that arcuate surface 100, but merging with a cam indent or recess 106 whose minimum spacing from the axis of the cam is less than the radius of cam portion 100. Indent 106 in turn merges with a cam nose 108 whose dimensions are preferably such that the maximum spacing of the outer surface thereof from the axis of the tube 64 is greater than the radius of the cam surface 100. The surface of the cam nose 108 in turn merges with another cam indent or recess 110, and this in turn merges with the cam periphery 100.

The fitting 52 has a screw-threaded bore extending laterally therefrom in an upwardly inclined direction, as best seen in Fig. 1, and located between the seals 84 and 86. A nozzle member 112 is mounted in said bore and is provided with one or more water discharge passages 114. The tube 64 has one or more apertures 116 therein located between the seals 84 and 86 and communicating with the bore in which the nozzle 112 is mounted.

In the operation of the device, assuming that it is connected to a source of water under pressure so that water enters and passes through the tube 64 and the arms 76 to be discharged at the nozzles 80, rotation of the arms 76 results which causes the sprinkling of a circular area, as illustrated by the dotted line 118 in Fig. 7. It will be understood that this rotating part of the sprinkler is substantially conventional and preferably the sprinkler will be so constructed as to substantially uniformly sprinkle the area outlined by the circular dotted line 118 of Fig. 7.

The rotation of the head 76 rotates the tube 64 and this, in turn, controls the position of the nozzle 112. Thus the rotation of the tube 64 rotates the cam 96 and each time the notch 102 of that cam comes into register with a lug 94 of the cam follower, the gear 90 of the cam follower is rotated through a predetermined arc or angle, here shown as substantially 90 degrees. Rotation of the gear 90 is transmitted through the gear 88 to the fitting 52 and controls the position of the nozzle 112. Stated differently, the position of the nozzle 112 is changed step-by-step or periodically between successive angularly displaced stations. Observe that the notched cam 96 and the cam follower with its lugs 94 seating in notch 102 somewhat resemble a Geneva motion mechanism.

The nozzle 112 is caused to oscillate laterally through an angle smaller than the angular displacement between stations, during a portion of the time that it dwells at each station. This oscillation is produced as a result of the contour of the cam 96, as illustrated in Figs. 3, 4, 5 and 6. As the cam 96 rotates from the position illustrated in Fig. 3, it carries with it the gear 90 until the pin 94' passes free of the slot 102 and the adjacent trailing pin 94'' rides upon or adjacent to the arcuate peripheral surface 100 of the cam. This produces a dwell of the nozzle 112 at a position to cause it to throw a stream of water outlined by dotted lines 120 in Fig. 7. The nozzle 112 will throw water a substantial distance and outside of the area 118 sprinkled by the nozzles 80 mounted on the arms 76. When the indentation 110 of the cam 96 contacts the pin 94'', as seen in Fig. 4, the gear 90 is permitted to rock or turn slightly, as in a counter-clockwise direction as illustrated in Fig. 4. The rocking of the gear 90 is transmitted through the gear 88 and the fitting 52 to the nozzle 112, causing it to be directed to and to sprinkle the area within the outline 122 in Fig. 7, being a clockwise position, as illustrated in Fig. 7, because Fig. 7 is a schematic top plan view whereas Fig. 4 is a bottom plan view. Continued rotation of cam 96 causes a cam nose 108 to contact the pin 94'' and to cause rocking of the gear 90 in a clockwise direction as viewed in Fig. 5, resulting in swinging of the nozzle to a position causing it to sprinkle the area outlined by the dotted line 124 in Fig. 7, assuming that the cam nose has a maximum spacing from the axis of the tube 64 somewhat greater than the spacing of the circular cam surface 100 from the axis of the tube 64. Continued rotation of the cam 96 causes the cam 94'' to drop into the cam depression 106 and then to ride over the cam surface 104 before the pin 94'' is received in the notch 102 and advanced through the quarter-revolution to bring the next pin, in a clockwise direction as viewed in Figs. 3 to 6, into engagement with the cam surface. It will be apparent that the number of cam noses or projections and cam depressions upon the surface of the cam may vary, so that the nozzle 112 may be oscillated between the positions illustrated in dotted lines 122, 124 in Fig. 7 through any desired number of times during each complete revolution of cam 96. It will be observed that the sprinkling area outlines 122 and 124 are of shorter length than the outline 120, resulting from the fact that the throw

of nozzle 112 during movement to and from positions 122 and 124 is less than the throw of water by the nozzle 112 while it is stationary, i. e., while it rides upon the cam surface 100.

One factor of importance in the operation of the device is the fact that the sealing members 84 and 86, by their frictional engagement with the water tube or column 64, tend to cause the fittings 52 and 62 to rotate with the column and thereby to rotate the gears 88 and 90. Thus, if we assume that the water column 64 is rotating in a clockwise direction, as viewed in Fig. 3, the parts 52, 62 and the gear 88 will tend to rotate in the same direction, and they will tend to rotate the gear 90 and the lugs 94 in the opposite direction. Thus there is a normal tendency of the gear 90 at all times to rotate in a counter-clockwise direction, as viewed in Figs. 3 to 6, inclusive, and this determines which of the pins 94 will engage the cam. Furthermore, it insures that the pin 94'', which does engage the cam, is pressed positively thereagainst to cause it to move to follow the cam contour and also to cause it to enter the notch 102 when the cam presents the notch adjacent to or in register with said pin.

Water discharges from the water column 64 through the apertures 116 into the space within the fittings 52 and 62 surrounding the water column, and thereafter passes to the nozzle. The size of the nozzle fitting will be such that the nozzle 112 is caused to throw a stream a greater distance than the rotating nozzles 80, and, consequently, to fill out the corners of the area to be sprinkled, as schematically illustrated in Fig. 7, in association with the oscillating movement between the positions 122 and 124. It is possible by this means to provide, at the corner portions of the square to be sprinkled and outside of the circular area 118, discharge of an amount of water equal to concentration at which water is discharged within the area 118, so that there is substantially uniform concentration of water discharge throughout the entire square area reached by the device.

A modified embodiment of the invention is illustrated in Figs. 8 to 11, inclusive. In this embodiment parts similar to those in the preceding embodiment of the invention bear the same reference numerals. The water column 64 carries a gear portion 65 which may either be a gear mounted fixedly thereon or may be a portion integral with the water column defined by cutting gear teeth in the surface of the water column. The gear portion 65 is located within the casing portion 42—46 and an internal ring gear 130 meshes with the gear 65, being held in meshing relation thereto by a pair of rollers 132 carried by pins 134 carried in the base 42 of the casing. The reduced tube portion 58 of the fitting 52 mounts a gear 88 meshing with the gear 90 as in the preferred construction. The gear 90 rotates on stud shaft 92 carried by the casing, and in turn carries a star wheel 136 which may have four points as shown or any other number dependent upon the shape of the area to be sprinkled. The points 137 of the star wheel 136 are adapted to engage the outer periphery 138 of the ring gear 130. The ring gear periphery 138 is interrupted by a notch 140 adapted to receive a point of the star wheel 137 and to advance the same whenever the gear notch 140 registers with a point 137.

The gear ratio between the gear 65 of the water column 64 and the ring gear 130 determines the number of revolutions of the sprinkler head which are required to produce one step of movement of the nozzle 141. It is possible by this arrangement to provide any desired ratio, and we have found that one ratio which works effectively is a four-to-one ratio, that is, a ratio in which the number of teeth on the gear 130 is four times the number of teeth on the gear section 65. It will be understood that the ratio need not be one in which the number of teeth upon the large gear is an exact multiple of the number of teeth upon the small gear. Thus a very wide range of gear ratios and operations is permissible, depending upon the requirements and the desired characteristics of operation of the device.



The outer periphery 138 of the ring gear may be of true cylindrical shape if a nozzle of the character illustrated in Fig. 10 is employed. Alternatively, it will be understood that this periphery may be a cam surface comparable to the surface 100—110 of the cam 96, in which event it may be desired to use the pins 94 instead of the star wheel 136.

It will be observed that the nozzle 141 illustrated in Fig. 10 is of substantially segmental shape with its sides diverging and with its top and bottom faces converging outwardly from its neck. The narrow arcuate end surface 142 of the nozzle 141 is provided with a series of apertures 144 spaced therealong, of which a central aperture 146 is of a different size than the remainder, so that a greater amount of water may be thrown a slightly greater distance from aperture 146 than is discharged through any of the apertures 144. This results in the production of a pattern of sprinkling as illustrated in Fig. 11, wherein the nozzle 141 discharges water in a pattern as shown at 148, projecting outwardly beyond the circular pattern of water discharged by the rotating sprinkler head and outlined by the line 150.

While the preferred embodiments of the invention have been illustrated and described, it will be understood that changes may be made in the construction of the device without departing from the spirit of the invention, as long as such changes fall within the scope of the appended claims.

We claim:

1. A lawn sprinkler comprising a housing adapted to be connected to a water conduit, a water reactance sprinkler unit rotatably mounted by said housing, a second sprinkler unit rotatably mounted by said housing substantially concentrically with said first unit, said sprinkler units discharging water simultaneously, and a driving connection between said sprinklers for intermittently and successively rotating the second sprinkler relative to four angularly displaced stations in a predetermined sequence, said second unit having a larger discharge range than said first unit to reach corner portions of a polygonal area to be sprinkled.

2. A lawn sprinkler comprising a housing adapted to be connected to a water conduit, a water reactance sprinkler unit rotatably mounted by said housing, a second sprinkler unit rotatably mounted by said housing substantially concentrically with said first unit and including a nozzle, said units discharging water simultaneously, and means actuated by said water reactance unit for rotating the nozzle of said second unit step by step and progressively between more than two predetermined angularly displaced relative positions.

3. A lawn sprinkler comprising a housing adapted to be connected to a water conduit, a water reactance sprinkler unit rotatably mounted by said housing, a second sprinkler unit rotatably mounted by said housing substantially concentrically with said first unit, said units discharging water simultaneously and means actuated by said water reactance unit for intermittently rotatively advancing said second unit through a predetermined angle and for training said second unit at a selected limited area between successive advances thereof.

4. A lawn sprinkler comprising a housing adapted to be connected to a water conduit, a water reactance sprinkler unit rotatably mounted by said housing, a second sprinkler unit rotatably mounted by said housing substantially concentrically with said first unit, said units discharging water simultaneously, means actuated by said water reactance unit for intermittently rotatively advancing said second unit through a predetermined angle, and including a notched rotatable member carried by said first unit and a member associated with said second unit and rotatably carried by said housing on an axis spaced

from said notched member, spaced projections on said last named member engageable with said rotatable member and adapted to enter said notch to be advanced thereby.

5. A lawn sprinkler comprising a housing adapted to be connected to a water conduit, a water reactance sprinkler unit rotatably mounted by said housing, a second sprinkler unit rotatably mounted by said housing substantially concentrically with said first unit, and means actuated by said water reactance unit for intermittently rotatively advancing said second unit through a predetermined angle and including a Geneva motion mechanism.

6. A lawn sprinkler comprising a housing adapted to be connected to a water conduit, a water reactance sprinkler unit rotatably mounted by said housing, a second sprinkler unit rotatably mounted by said housing substantially concentrically with said first unit, and means actuated by said water reactance unit for intermittently rotatively advancing said second unit through a predetermined angle, said first unit including a substantially vertical rotatable water column, a rotatable member having a notch therein and a driving connection with said water column, said second unit including a fitting encircling a portion of said water column, said water column having a water discharge aperture communicating with said fitting, a member rotatably carried by said housing on an axis spaced from said notched member and having spaced projections successively engageable with said notched member to enter said notch to be shifted thereby, said rotatable member having a smooth periphery positioning a projection of said last named member between successive engagements of said notch with said projections.

7. A lawn sprinkler comprising a housing adapted to be connected to a water conduit, a water reactance sprinkler unit rotatably mounted by said housing, a second sprinkler unit rotatably mounted by said housing substantially concentrically with said first unit, said units being in constant communication with said conduit, and means actuated by said water reactance unit for intermittently rotatively advancing said second unit through a predetermined angle, and including a rotary cam carried by said first unit and a cam follower shiftably carried by said housing and having a driving connection with said second unit.

8. A lawn sprinkler comprising a housing adapted to be connected to a water conduit, a water reactance sprinkler unit rotatably mounted by said housing, a second sprinkler unit rotatably mounted by said housing substantially concentrically with said first unit, both units continuously communicating with said conduit, and means actuated by said water reactance unit for intermittently rotatively advancing said second unit through a predetermined angle, and including a rotatable member on said first unit having a notch therein and a member connected with said second unit and shiftably carried by said housing to engage the notched surface of said notched member for advance thereof upon entering said notch and dwell thereof between successive engagements of said member with said notch.

9. A lawn sprinkler comprising a housing adapted to be connected to a water conduit, a water reactance sprinkler unit rotatably mounted by said housing, a second sprinkler unit rotatably mounted by said housing substantially concentrically with said first unit, both units communicating continuously with said conduit, and means actuated by said water reactance unit for intermittently rotatively advancing said second unit through a predetermined angle, and including a rotary cam carried by said first unit and having an irregular camming surface interrupted by a notch, and a cam follower shiftably carried by said housing and having a driving connection with said second unit, said cam follower engaging the notched camming surface of said cam.

10. A lawn sprinkler comprising a housing adapted to be connected to a water conduit, a water reactance sprinkler unit rotatably mounted by said housing, a second sprinkler unit rotatably mounted by said housing substantially concentrically with said first unit, said units discharging water simultaneously, and means actuated by said water reactance unit for intermittently rotatively advancing said second unit through a predetermined angle and for laterally oscillating said second unit through a smaller angle between said intermittent advances.

11. A lawn sprinkler comprising a housing adapted to be connected to a water conduit, a water reactance sprinkler unit rotatably mounted by said housing, a second sprinkler unit mounted by said housing substantially concentrically with said first unit, and means actuated by said water reactance unit for intermittently rotatively advancing said second unit through a predetermined angle, and including a pair of juxtaposed rotative parts, one part having spaced projections and the other part having a smooth perimetral surface engageable by said projections and interrupted by a notch adapted to receive and advance a projection, and friction means engaging said units and normally tending to transmit rotation from said first unit to said second unit and to position said second unit to urge a projection of said one drive transmitting part into engagement with the notched surface of said other part.

12. A lawn sprinkler comprising a housing adapted to be connected to a water conduit, a water reactance sprinkler unit rotatably mounted by said housing, a second sprinkler unit rotatably mounted by said housing substantially concentrically with said first unit, and means actuated by said water reactance unit for intermittently rotatively advancing said second unit through a predetermined angle, and including a drive gear on said first unit, a ring gear encircling and meshing with said drive gear and having a notched surface, a rotatable member carried by said housing for driving said second unit, and spaced projections on said last named member engaging said notched surface and adapted to enter said notch to be advanced thereby.

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