Jan. 19, 1960 W. W. BALLARD 2,921,474

SPRINKLERS

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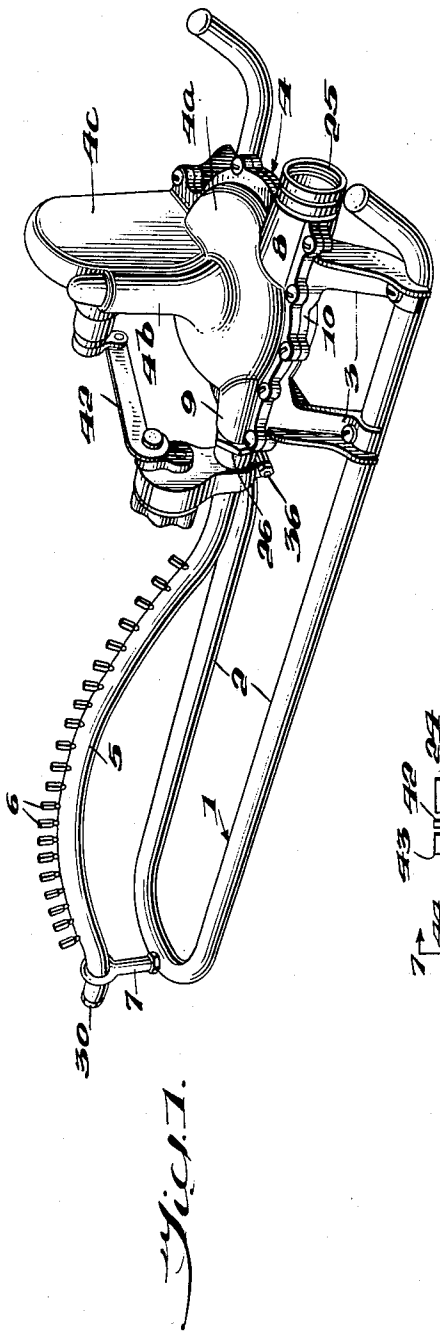


Fig. 1.

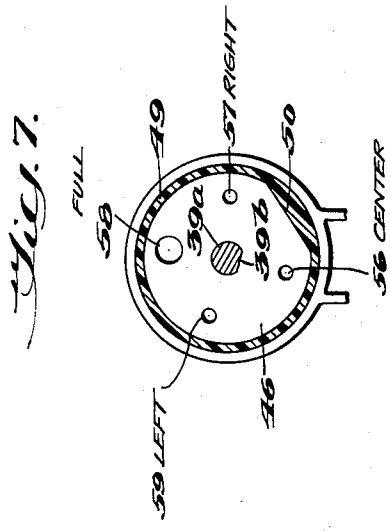


Fig. 7.

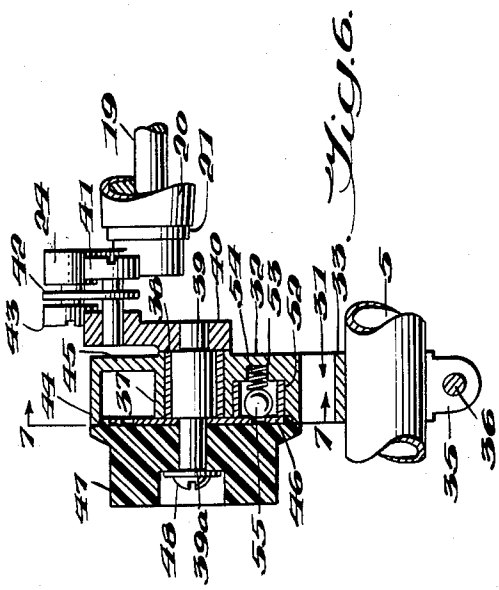


Fig. 6.

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Fig. 2.

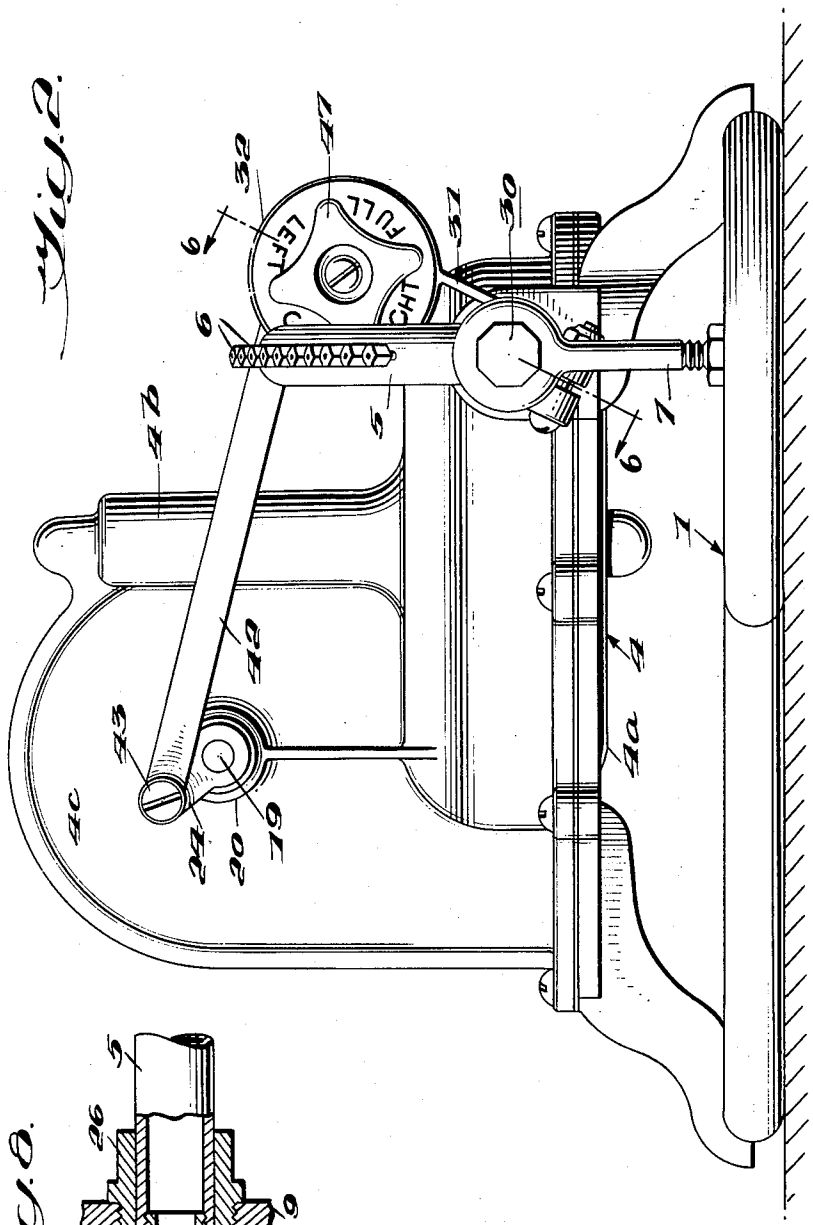


Fig. 6.

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Fig. 5.

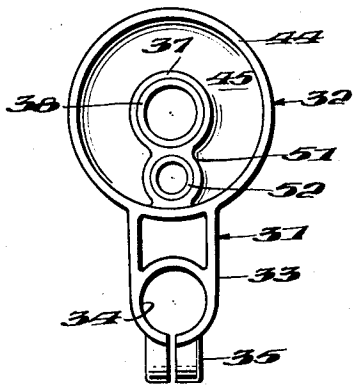


Fig. 4.

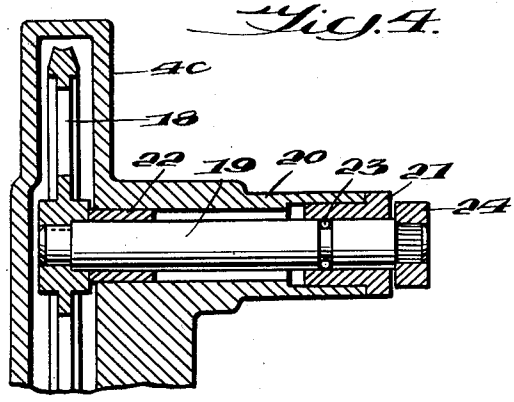
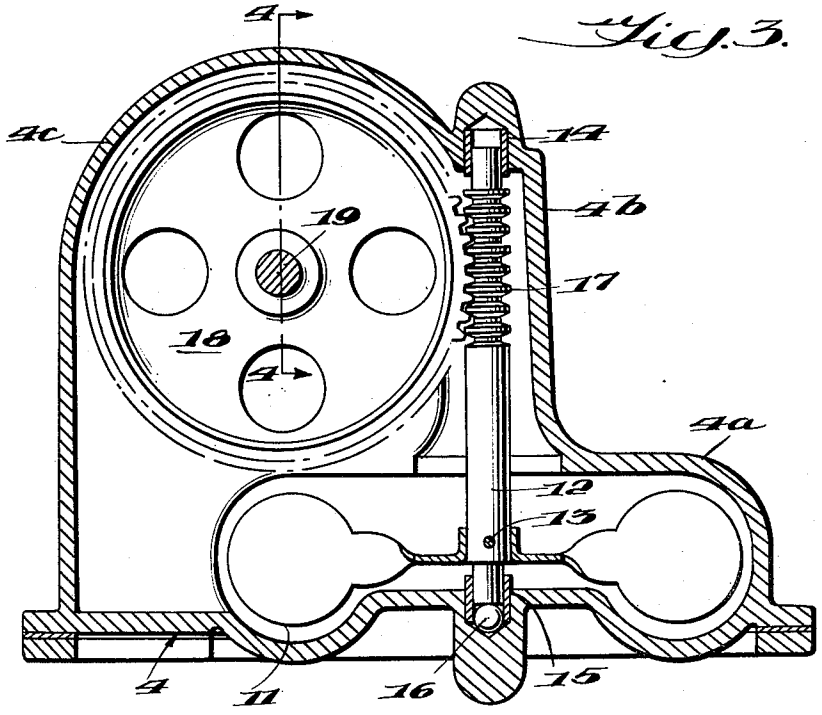


Fig. 3.



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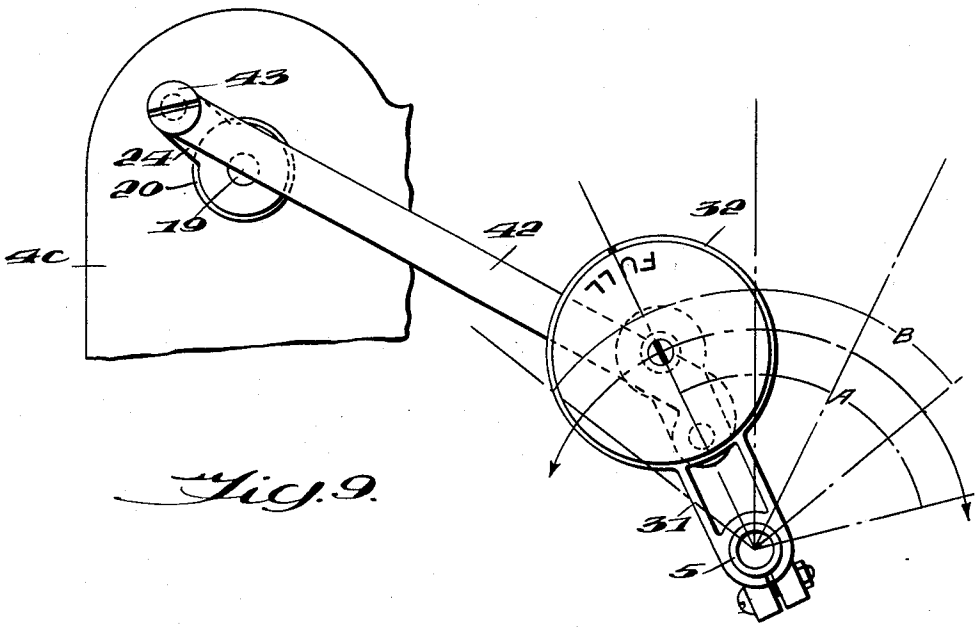


Fig. 9.

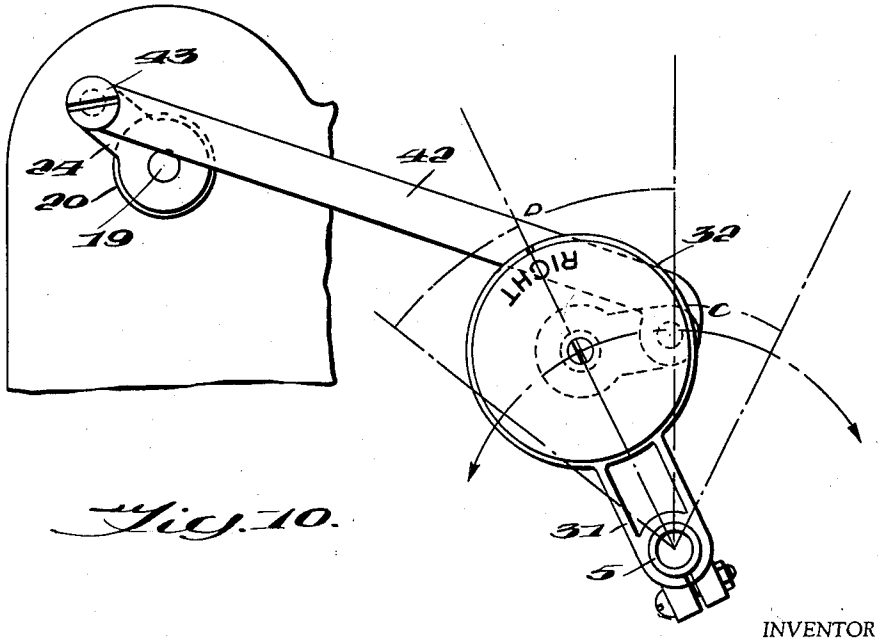


Fig. 10.

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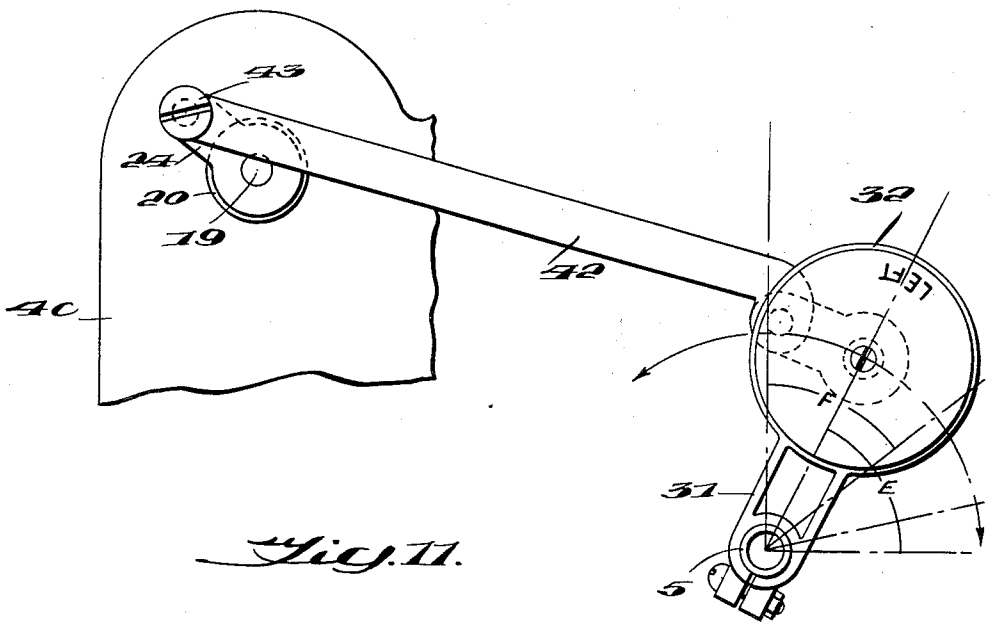


Fig. 11.

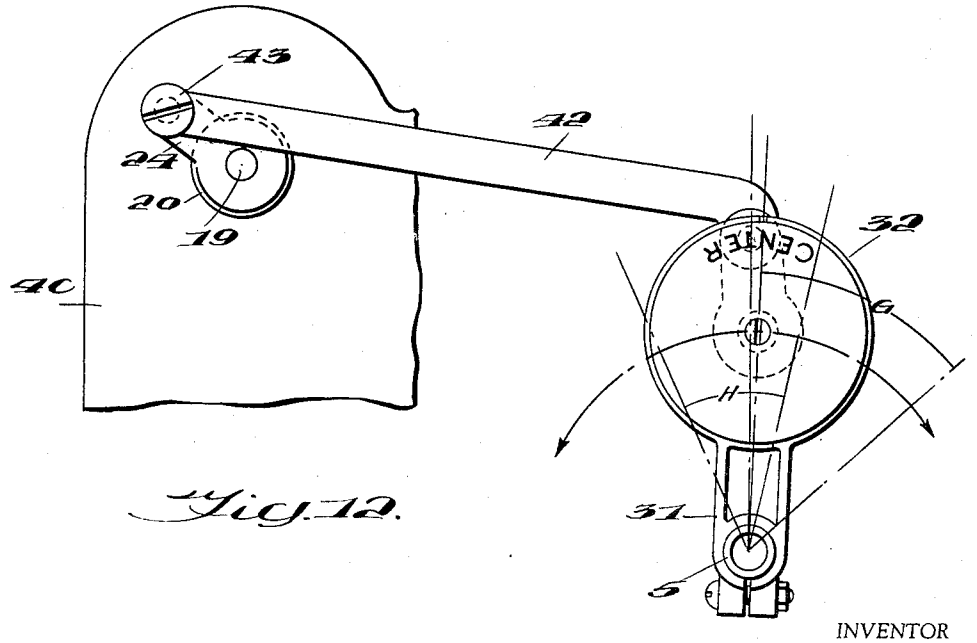


Fig. 12.

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SPRINKLERS

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Continuation of application Serial No. 525,119, July 29, 1955. This application January 13, 1958, Serial No. 708,723

2 Claims. (Cl. 74—42)

This invention relates to oscillating sprinklers and particularly to an improved oscillating sprinkler including novel means by which the area to which the sprinkler distributes fluid may be selectively adjusted. The invention is particularly applicable to lawn sprinklers of the so-called "wave" type, comprising a generally horizontally disposed sprinkler pipe with upwardly directed discharge means, a rotary driving motor, and means connecting the motor to oscillate the sprinkler pipe about a longitudinal axis.

Efforts have been made in the prior art to provide sprinklers of the type described with satisfactory means for adjusting both the extent and the location of the area to be sprinkled. Thus, it is frequently desired to sprinkle either a wide rectangular area or a narrow rectangular area and to so adjust the sprinkler that such area falls either entirely at the left side or entirely at the right side of the sprinkler or is centered on the sprinkler. One such prior-art device is disclosed in United States Patent 1,696,385. However, such devices have not been entirely satisfactory because the drive mechanisms involved have been rather complex, and, it has usually been necessary to disengage one part of the driving mechanism from its usual connection and reengage such part in another position to effect the desired adjustment.

An object of the present invention is to devise such a sprinkler with improved manually adjustable means for selecting the extent and position of the area to be sprinkled, such means requiring only the adjustment of a simple rotary knob to effect the desired selection. A further object is to provide such a mechanism which is simpler in design, more positive in operation, and more economical to manufacture, than are corresponding devices presently in use for this purpose.

In order that these and other objects of the invention may be understood in detail, reference is had to the accompanying drawings, which form a part of this specification, and wherein:

Fig. 1 is a side view in perspective of a sprinkler constructed in accordance with a preferred embodiment of the invention;

Fig. 2 is an end elevational view of the sprinkler of Fig. 1 on an enlarged scale;

Fig. 3 is a transverse vertical sectional view illustrating the driving motor and associated gearing of the device of Fig. 2;

Fig. 4 is a fragmentary vertical sectional view taken on the line 4—4, Fig. 3;

Fig. 5 is a side elevational view of lever means employed in the device of Fig. 1 to oscillate the sprinkler pipe of such device on an enlarged scale;

Fig. 6 is a sectional view taken on the line 6—6, Fig. 2, and illustrating some parts in elevation and other parts broken away;

Fig. 7 is a sectional view taken on the line 7—7, Fig. 6;

Fig. 8 is a detail sectional view illustrating the manner

in which the sprinkler pipe of the device of Fig. 1 is connected to the motor housing of such device on an enlarged scale, and

Figs. 9–12 are diagrams illustrating the relative position of various parts of the sprinkler pipe oscillating means, each figure corresponding to a different adjustment of such mechanism.

Referring now to the drawings in detail, and first to Figs. 1–3 thereof, it will be seen that the embodiment of the invention here illustrated comprises a frame 1 including ground-engaging runners 2. Supported at one end of the frame by legs 3 is a drive motor housing 4 which also serves as a water supply chamber. A generally horizontally extending sprinkler pipe 5, equipped with upwardly directed discharge nozzles 6 arranged in a longitudinally extending series, is journalled at one end in a support 7 and at the other end in the housing 4.

The housing 4 includes a horizontally disposed, generally circular portion 4*a*, vertical tubular portion 4*b* centered on said horizontal section and extending upwardly therefrom, and a portion 4*c* of generally rectangular cross-section extending radially of the horizontal portion and outwardly from the vertical portion. The circular horizontal portion 4*a* of the housing 4 is provided with a tubular water inlet 8 and a tubular water discharge 9, the inlet 8 and discharge 9 being aligned with each other and disposed tangentially with respect to the circular portion 4*a*. The entire housing 4 may be made in two halves joined along the line 10 by suitable fastening means, which halves may be produced by die casting. As seen in Fig. 3, the circular portion 4*a* of housing 4 encloses the horizontally disposed impeller wheel 11 of a water motor, the wheel 11 being secured to a shaft 12, as by pin 13. The shaft 12 is disposed within tubular portion 4*b* of the housing and is journalled at its ends in sleeve bearings 14 and 15. The lower end of shaft 12 rests upon a ball 16 disposed within the sleeve bearing 15. Toward its upper end, the shaft 12 is provided with worm threads 17 engaging a worm wheel 18. The worm wheel 18 is disposed in portion 4*c* of the housing 4 and is rigidly attached to a shaft 19 extending forwardly from the housing and generally parallel to the sprinkler pipe 5.

As seen in Figs. 2 and 4, portion 4*c* of housing 4 is provided with a forwardly directed tubular extension 20 which houses the shaft 19. The tip of extension 20 is provided with a sleeve bearing 21, and a second sleeve bearing 22 is provided adjacent worm wheel 18 in order to rotatively position the shaft 19, as best seen in Fig. 4. Within the bearing 21, shaft 19 is provided with an annular groove receiving an O-ring 23, acting as a seal to prevent escape of liquid from the chamber 4 via extension 20. The shaft 19 extends beyond sleeve bearing 21 and at its free tip has secured thereto a crank arm 24.

Referring again to Fig. 1, it will be seen that the inlet portion 8 of housing 4 is provided with a threaded connector nut 25, attached in any suitable manner to the housing, in order that an ordinary garden hose or the like may be connected to the housing to supply water under pressure thereto. As is the usual practice, a tapered nozzle (not shown) is disposed within the inlet portion 8 in order to direct a concentrated stream of water tangentially against the impeller 11.

As best seen in Fig. 8, the outlet portion 9 of housing 4 is provided with a tubular bearing 26 which is threaded into the portion 9 of housing 4 and embraces the end of sprinkler pipe 5. The sprinkler pipe extends inwardly of the housing beyond the inner end of bearing 26. A tubular member 27, provided with a transverse annular shoulder 28, is threaded into the end of sprinkler pipe 5, so that the annular shoulder combines with the inner end of bearing 26 to provide an annular space receiving

O-ring 29 to seal the assembly. It will be noted from Fig. 1 that inlet portion 8 and outlet portion 9 are aligned so that water supplied via coupling nut 25 will be first directed against the impeller wheel 11, Fig. 3, to rotate the same, and will then be directed outwardly through outlet portion 9, tubular member 27 and into sprinkler pipe 5. The forward end of sprinkler pipe 5, adjacent support 7, is closed by a suitable plug 30, Figs. 1 and 2, so that water delivered to the pipe 5 is discharged outwardly via the nozzles 6.

Just forwardly of bearing 26, there is clamped to the sprinkler pipe 5 a bracket 31 forming one part of a 2-part lever means in which the parts are selectively disposable in different angular relations with respect to each other. As best seen in Figs. 5 and 6, the bracket 31 includes a circular portion 32 and a stem portion 33, the latter being provided with a bore 34 and ears 35 in order that the sprinkler pipe 5 may be secured within the bore 34 by means of a bolt 36 extending through the ears 35. The circular portion 32 of bracket 31 is provided with a central boss 37 in which is positioned a sleeve bearing 38. Journalled in bearing 38 is a shaft 39, the ends of the shaft extending beyond the confines of the circular portion 32. Beyond the face of bracket 31 adjacent the housing 4, the shaft 39 is rigidly connected to a crank 40 which forms the other part of said 2-part lever means. The end of crank 40 is provided with a screw 41, the shank of the screw including a plain portion pivotally engaged in an opening in one end of a connecting rod 42, as will be evident from Figs. 1 and 6. The other end of the connecting rod 42 is pivotally connected to the end of crank 24, hereinbefore described with reference to Fig. 4, by means of a machine screw 43, Fig. 6.

It will be noted that the sprinkler pipe 5 is longitudinally curved, with nozzles 6 spaced along the outer edge of the curving pipe. The sprinkler pipe may thus be said to have a central position in which the curving pipe lies in a vertical plane. It will be seen from Figs. 2 and 11 that, when the sprinkler pipe is in its central position, the bracket 31 extends to the right of such vertical plane (as viewed from the end of the sprinkler carrying support 7) at an angle which, in the particular embodiment illustrated, is approximately 26.5°.

As seen in Figs. 5 and 6, circular portion 32 of bracket 31 is of generally cup-shaped formation, and includes a generally cylindrical wall 44. The annular space between boss 37 and wall 44 is closed, at the face of bracket 31 directed toward housing 4, by circular wall 45. At the face of the bracket 31 directed toward the free end of sprinkler pipe 5, this annular space is closed by means of an index plate 46 and an adjusting knob 47, as seen in Fig. 6. At this face of the bracket, the shaft 39 is provided with a portion 39^a of reduced diameter, such portion being provided with a flat face 39^b, as best seen in Fig. 7, so that the index plate 46 and the knob 47 are fixed against rotation relative to shaft 39, and thus also relative to crank 40. The end of portion 39^a of shaft 39 is provided with an axially disposed threaded bore receiving a screw 48, Fig. 6, to retain the associated parts in assembled position. From Fig. 6, it will be noted that the index plate 46 is of smaller diameter than the inner surface of cylindrical wall 44, so that there is an annular space between these two elements. Such space is filled by an annular flange 49 integral with the back of knob 47. Such annular flange tightly embraces the index plate 46 and the flange 49 and index plate 46 are provided with matching straight line portions, as indicated at 50, Fig. 7, to assist in preventing relative rotation between the index plate and the knob.

As best seen in Fig. 5, the circular portion 32 of bracket 31 is provided below boss 37 with a second boss 51 in which is positioned a metal sleeve 52. At this point, the thickness of wall 45 is increased, and a bore 53, Fig. 6, is provided coaxially with the sleeve 52. A helical spring 54 is disposed in bore 53, and a metal ball 55 is disposed between the spring 54 and index plate 46. As illustrated in Fig. 7, index plate 46 is provided with an annular series of circular recesses 56–59, the recesses 56–59 being spaced radially outward of the axis of shaft 39 at a distance such that, as knob 47 is rotated, the recesses 56–59 will be brought successively into engagement with ball 55.

Thus, shaft 39, and therefore crank 40, may be rotatably adjusted with respect to bracket 31 by means of knob 47. And, if the adjustment is such that the ball 55 is urged into engagement with one of the recesses 56–59 by the spring 54, the relative angular position between crank 40 and brackets 31 will be maintained.

In operation, coupling nut 25 is connected to an ordinary garden hose or any other suitable source of water under pressure. Knob 47 is then adjusted until the one of recesses 56–59 desired is brought into engagement with ball 55. This adjustment will be observable because of slight snap action which occurs when the ball 55 is forced into the recess. Further, the face of knob 47 is provided with suitable indicia, such as the words "center," "right," "full" and "left," as seen in Fig. 2, and each word may be accompanied by a suitable pointer which may be brought into registry with an index mark on the exterior of wall 44. Water from the supply flows into engagement with the impeller wheel 11, Fig. 3, rotating the same and so causing rotation of worm wheel 18. Worm wheel shaft 19 is thus continuously rotated in one direction, and the crank 24 is similarly rotated. Rotation of crank 24 correspondingly moves connecting rod 42, so that the two-part lever assembly comprising crank 40 and bracket 31 is caused to oscillate about the axis of sprinkler pipe 5. Since the bracket 31 is rigidly connected to the sprinkler pipe, the sprinkler pipe is correspondingly oscillated, so that the discharge from nozzles 6 is directed over a ground area dependent upon the water pressure and the extent of oscillation of the sprinkler pipe.

As will be evident from a study of Fig. 1 and of the diagrams of Figs. 9–12, the mode of oscillation imparted to sprinkler pipe 5 by the driving means depends upon the relative angular position between the crank 40 and the bracket 31. Thus, if the knob 47 is adjusted to "full" position, the ball 55 will be engaged in recess 58 and the crank 40 will be substantially aligned with bracket 31 and will extend from the shaft 39 toward sprinkler pipe 5. The pivotal connection between connecting rod 42 and crank 40 is therefore positioned relatively close to the pipe 5, so that the bracket 31 and crank 40 form a relatively short effective lever. Rotation of shaft 19 and crank 24 therefore cause the bracket 31 to be swung through an angle A, Fig. 9, and the sprinkler pipe 5 to be swung through an angle B, Fig. 9. Since the effective lever provided by the bracket 31 and crank 40 in this adjustment of the device is relatively short, the angle A is correspondingly relatively large. It will be noted that angle B is centered on a vertical line, so that the discharge from the nozzle 6 will be distributed equally on both sides of the sprinkler.

If adjustment of knob 47 is such that recess 57 engages ball 55, then crank 40 will extend to the right of bracket 31 (considering the sprinkler as viewed from the end carrying support 7). Referring to Fig. 10, it will be seen that rotation of crank 24 now causes bracket 31 to swing through an angle C, so that sprinkler pipe 5 is swung through an angle D. As has been pointed out, the bracket 31 is fixed to the sprinkler pipe at an angle to the plane of curve of the sprinkler pipe such that such plane always lies between the bracket and drive shaft 19. The parts are so proportioned and positioned that angle C will be centered on the vertical normal plane of the sprinkler pipe, while such plane defines one side of angle D extending to the right of the sprinkler (viewing the same from the end carrying housing 4). Thus, for this adjustment of the oscillating means, the discharge from

sprinkler pipe 5 is directed entirely to the right of the sprinkler (viewing the same from the end carrying housing 4).

On the other hand, if knob 47 is adjusted so that ball 55 engages recess 59, crank 40 will extend away from the bracket 31 in the opposite sense from that just described. Thus, referring now to Fig. 11, it will be seen that this adjustment causes rotation of crank 24 to result in oscillation of the bracket 31 through an angle E, while the sprinkler pipe 5 is swung through an angle F, the later being located to the left of the sprinkler (viewing the same from the end carrying housing 4) so that the discharge from the nozzles 6 is directed to the left.

Comparing the two adjustments illustrated in Figs. 10 and 11, it will be noted that the effective lever provided by bracket 31 and crank 40 is of the same length for each adjustment, so that angles D and F are equal. However, the position of crank 40 shortens the effective length of connecting rod 42, in the adjustment of Fig. 10, so that angle D lies to the right of the sprinkler, and increases such effective length, in the adjustment of Fig. 11, so that angle F lies to the right of the sprinkler.

If knob 47 be now adjusted so that recess 56 engages ball 55, crank 40 will extend away from the sprinkler pipe 5. As seen in Fig. 12, this adjustment results in oscillation of bracket 31 through angle G, while the sprinkler pipe 5 is oscillated through angle H. The effective lever now provided by bracket 31 and crank 40 is now longer than that provided by the adjustment illustrated in Fig. 9, and the extent of oscillation imparted to the sprinkler is correspondingly less. Angle H is substantially centered upon the sprinkler.

I have found it desirable and advantageous to make recess 58, which selects the full swing setting of the drive mechanism, somewhat larger than the other apertures, so that the ball 55 will be more securely seated therein. In this manner, a rigid connection between crank 40 and bracket 31 is assured throughout the more extensive oscillation of the spray pipe. All of the recesses 56—59 are so proportioned, with respect to the size of ball 55, and the strength of spring 54 is so selected, that the engagement between the ball and any of the recesses selected by adjustment of knob 47 will be sufficiently secure to maintain the particular angular relation selected between crank 40 and bracket 31 during operation of the device.

This is a continuation of my application Serial No. 525,119, filed July 29, 1955, now abandoned.

I claim:

1. Linkage mechanism operatively connecting a horizontal driven shaft and an elongated oscillatable member disposed in laterally spaced relation thereto; comprising an elongated bracket having an end thereof secured to said member for oscillation therewith and extending laterally therefrom, said bracket at the other end thereof comprising an outer cylindrical wall and an inner cylindrical boss concentric with said cylindrical wall, a circular wall interconnecting adjacent ends of said cylindrical wall and said cylindrical boss, an adjusting shaft rotatably journalled in said boss, an index plate mounted on said adjusting shaft for rotation therewith and being disposed within said cylindrical wall adjacent the free edge thereof, said index plate being provided with an annular series of recesses arranged concentrically with respect to the axis of said adjusting shaft, a detent disposed within said bracket and being disposed for selective engagement with said recesses as said index plate is rotated, resilient means supported within said bracket and bearing on said detent for constantly urging same toward said index plate, an adjusting knob disposed outwardly of said index plate and secured to said adjusting shaft for selecting the rotational position of said index plate, crank means secured to said adjusting shaft and being rotatable therewith, a crank secured to said driven shaft, a connecting rod having one end thereof pivotally connected to said crank, and means pivotally connecting the other end of said connecting rod to said crank means.

2. The structure according to claim 1, wherein said index plate is of less diameter than the inner surface of said cylindrical wall providing an annular space therebetween, said adjusting knob being provided with an annular flange disposed within said space, and said flange and said index plate being provided with cooperating straight portions for preventing relative rotation between the index plate and the adjusting knob.

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