May 14, 1968 F. HAUSER 3,383,047

SPRINKLER

Filed Nov. 19, 1965 2 Sheets-Sheet 1

FIG. 10.

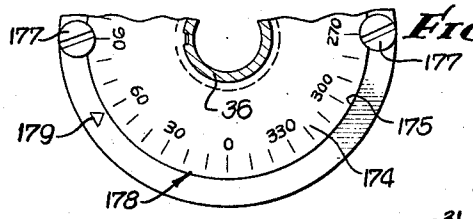


FIG. 1.

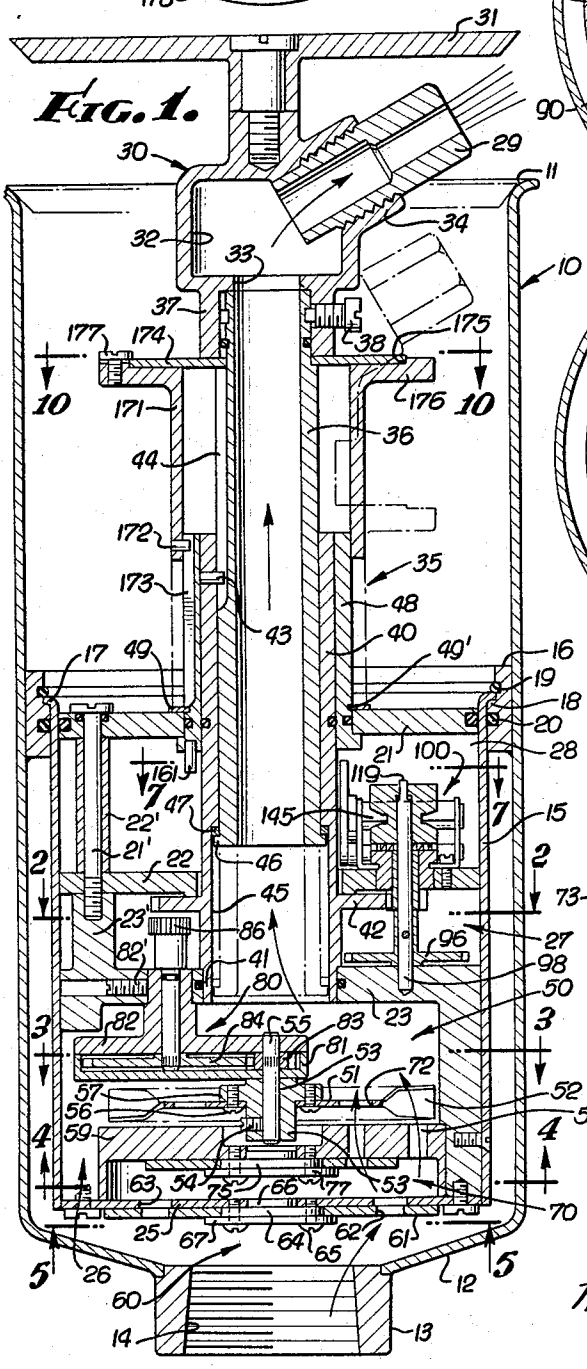


FIG. 2.

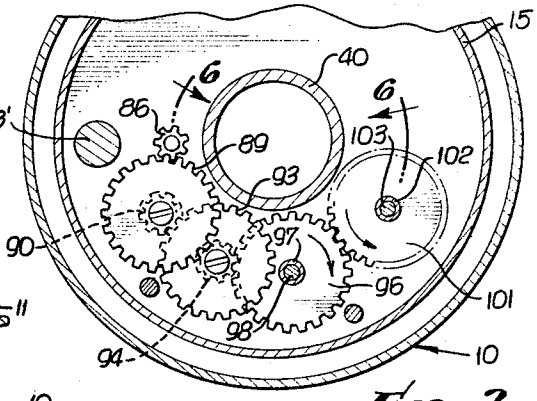


FIG. 3.

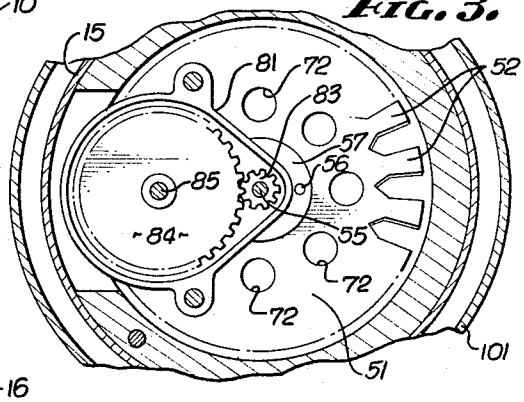
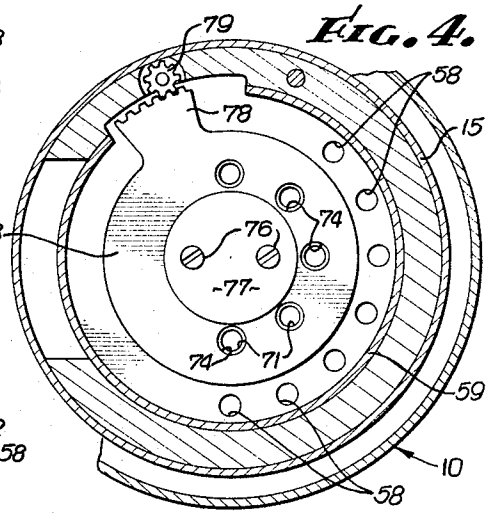


FIG. 4.



INVENTOR.
FRED HAUSER
BY
Miketta, Glenny, Poms & Smith
ATTORNEYS.

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FIG. 6.

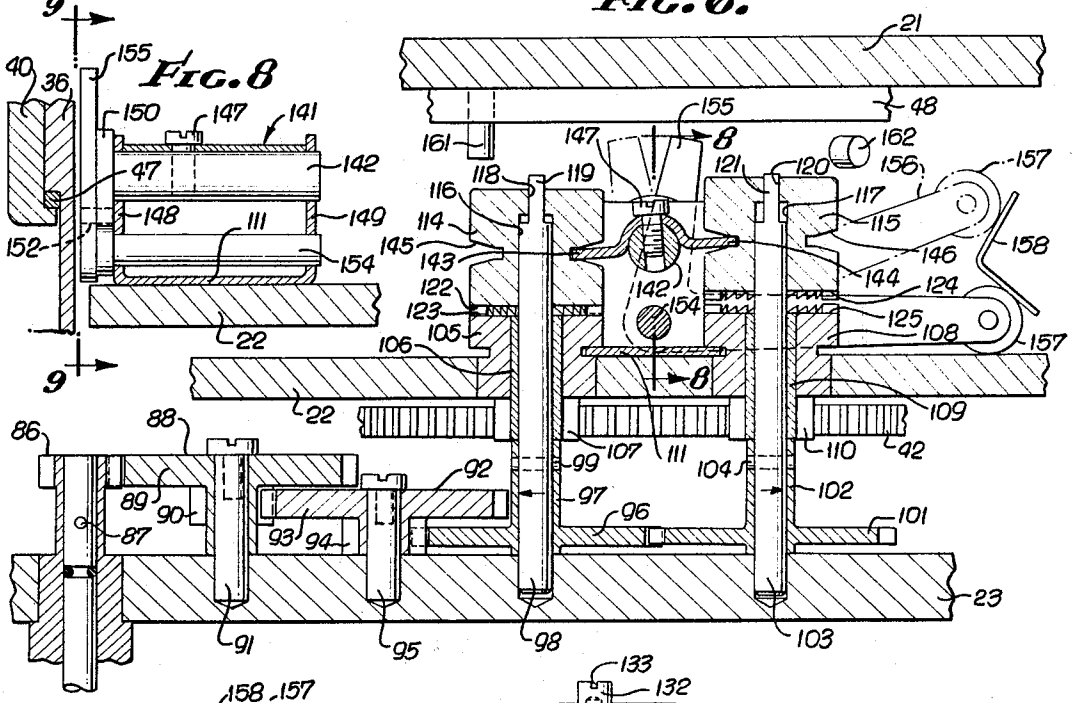
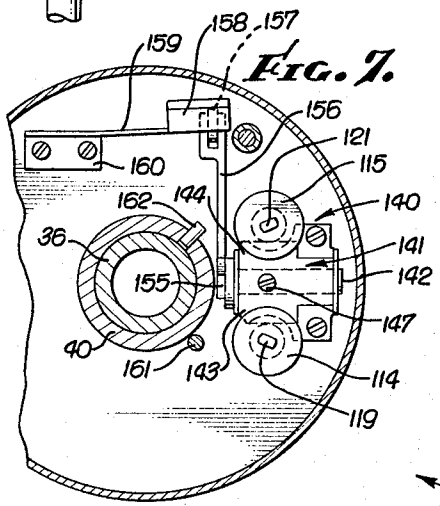
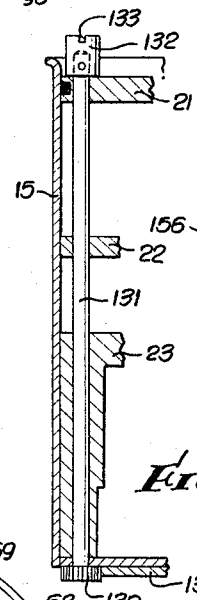


FIG. 8.

FIG. 7.





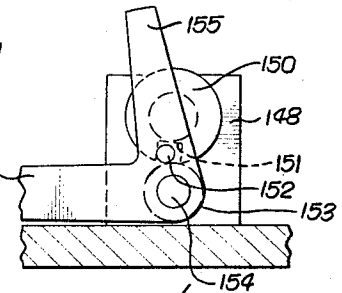
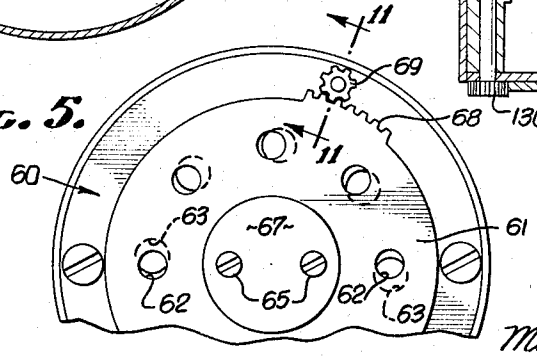


FIG. 9.

FIG. 11.

FIG. 5.



INVENTOR.
FRED HAUSER
BY
Miketta, Glenny, Poms & Smith
ATTORNEYS.

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SPRINKLER

Fred Hauser, 1544 Midvale Ave.,
Los Angeles, Calif. 90024

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12 Claims. (Cl. 239—206)

ABSTRACT OF THE DISCLOSURE

A pop-up type of water sprinkler including a water operable motor means for driving a sprinkler head, a clutch and drive train interconnecting the water motor and sprinkler head for driving the sprinkler head in a reciprocable adjustable arcuate movement, and including means for adjusting the water pressure so as to control the length and size of the stream of water ejected from the sprinkler head and means for adjusting the speed of the reciprocable arcuate movement of the sprinkler head.

This invention relates in general to sprinklers used to water lawns, yards and gardens, or the like. More particularly, this invention relates to such sprinklers in which a sprinkler head is rotated in part or full cycle rotations by a motor means operated within the sprinkler by the water to be ejected at the sprinkler head.

In many sprinkling operations, it is highly desriable to be able to adjust the sprinkler, while it is operating, to sprinkle over selectable areas to be covered. Prior sprinkler devices which have employed fluid motor means therein to operate the sprinkler, have not been adjustable to easily vary the speed of rotation of the head, the size of the arc of rotation in part cycle rotational settings, the location of the arcuate sprinkled area, nor the water pressure to vary the size or length of a stream of water ejected therefrom. It is the principal object of this invention to disclose and provide a universally adjustable sprinkler which overcomes all of the foregoing shortcomings of the prior sprinkler devices.

It is therefore, a primary object of the present invention to disclose and provide a sprinkler device in which the sprinkler head is reversibly rotated within an adjustable arc or part cycle rotation wherein the size and location of the arc of rotation is readily adjustable even while the sprinkler is operating.

It is another object of the present invention to disclose and provide a sprinkler device as in the foregoing object wherein visually observable indicator means are provided to indicate visibly the size and location of the arc of rotation the sprinkler head is set to move within.

It is an object of the present invention to disclose and provide a sprinkler device in which the speed of rotation imparted to the sprinkler head and nozzle by the fluid motor operated within the sprinkler, by the water to be ejected through the sprinkler head, is adjustable during the operation of the sprinkler by means at the sprinkler without changing the water pressure being supplied to the sprinkler device and without changing the size or length of the water stream ejected from the sprinkler head.

It is another object of the present invention to disclose and provide a sprinkler device in which the water pressure entering the sprinkler from a water main is adjustable at the sprinkler to vary the water pressure of the water to be ejected by the sprinkler head nozzle and to thereby selectably adjust the length of the water stream ejected from the sprinkler or head during its operation.

It is another object of the present invention to disclose and provide a sprinkler device in which the power developed by a fluid motor within the sprinkler is transmitted to the sprinkler head by a transmission means including reversible clutch mechanisms of the positive clutch type and means for operating such mechanisms to reverse the sprinkler head rotation in response to the relative positioning of body portions of the sprinkler supporting the sprinkler head and nozzle.

It is a still further object of the present invention to disclose and provide a sprinkler device and clutch mechanism as in the foregoing object wherein the means for operating the reversible clutch mechanisms is easily adjustable while the sprinkler is operating to allow the adjustment of the size and location of the arcuate movement of the sprinkler head.

These and further objects and various advantages of the sprinkler device of the present invention will become apparent to those skilled in the art from a consideration of the following detailed explanation of an exemplary embodiment thereof. Reference will be made to the appended sheets of drawings in which:

FIG. 1 is a vertical sectional view of an exemplary embodiment of a sprinkler device, in accordance with the present invention;

FIG. 2 is a cross section of the embodiment of FIG. 1 taken therein along the plane 2—2;

FIG. 3 is a cross section of the embodiment of FIG. 1 taken therein in the plane 3—3;

FIG. 4 is a cross section of the embodiment of FIG. 1 taken therein along the plane 4—4;

FIG. 5 is a cross section of the embodiment of FIG. 1 taken therein along the plane 5—5;

FIG. 6 is a detail sectional view of the embodiment of FIG. 1 taken in the plane 6—6 of FIG. 2;

FIG. 7 is a cross section of the embodiment of FIG. 1 taken therein in the plane 7—7;

FIG. 8 is a detail view of the embodiment of FIG. 1 taken in the plane 8—8 in FIG. 6;

FIG. 9 is a detail view of the exemplary embodiment taken in the plane 9—9 of FIG. 8;

FIG. 10 is a cross section of the embodiment of FIG. 1 taken therein in the plane 10—10; and

FIG. 11 is an exemplary embodiment of means for manually manipulating a pinion, as employed in the embodiment of FIGS. 1 through 10.

A detailed explanation of an exemplary embodiment of the pop-up lawn sprinkler, according to the present invention, will now be made. Referring first to FIG. 1, the exemplary lawn sprinkler includes a sprinkler main housing, indicated generally at **10**, within which all operating parts are contained when the sprinkler is not in use.

Generally stated, the sprinkler housing encloses a sprinkler head, indicated generally at **30**, rotatably mounted upon a sprinkler body indicated generally at **35**. The sprinkler head and body are slidable vertically within a rotating drive sleeve **40**. The rotation of the sprinkler is powered by fluid motor means, indicated generally at **50**, through a gear train means, indicated generally at **80**. The fluid motor means, indicated generally at **50**, is driven by water passing through the sprinkler and drives the sprinkler head through means for engaging and disengaging the fluid motor with the sprinkler body and head, indicated generally at **100**.

The sprinkler main housing, indicated generally at **10**, is preferably tubular with a flanged open top end **11**. The lower end of the main housing is preferably provided with a closed bottom end wall **12** having a centrally disposed water inlet fitting **13**. Inlet **13** is provided with internal threads **14** to allow mounting the sprinkler main housing to the free end of a water pipe embedded or recessed into the ground at the location of intended use for the sprinkler.

An inner housing 15 is provided in the lower half of the main housing to enclose means for rotatably mounting and driving the sprinkler body portion indicated generally at 35. Inner housing 15 is supported within the main housing by an annular positioning ring 16 which may be press-fitted into a mid-portion of the main housing. Laterally extending lip means 17 at the upper end of the inner housing 15, in the exemplary embodiment, are seated upon an annular lip 18 provided on the positioning ring 16. A spring wire retainer 19 may be inserted into an inner groove provided in the positioning ring 16, spaced above the seat or lip 18, to lock the inner housing flange 17 down upon the lip or seat 18. An O-ring seal means 20 may be provided between the inner housing 15 and the surrounding portion of the positioning ring 16 to the prevent passage of water therebetween.

Partition walls divide inner housing 15 into separate chambers or compartments in the exemplary embodiment. Such partition walls include a top partition wall 21, an intermediate partition wall 22, a lower partition wall 23 and a bottom wall 25.

Partition spacer means 22' and 23' may be provided with walls 21, 22 and 23 connected by bolt 21' as seen in FIG. 1.

A motor chamber, indicated generally at 26, is formed between the bottom wall 25, lower partition wall 23 and the surrounding side walls of inner housing 15. A gear train chamber, indicated generally at 27, is formed between the lower partition wall 23, intermediate wall 22 and surrounding side walls of the housing 15. A third inner chamber, a clutch receiving chamber indicated generally at 28, is formed between the intermediate wall 22, top partition wall 21 and the side walls of the inner housing 15.

The sprinkler head, indicated generally at 30, includes a lid 31 adapted to seat upon the main housing flanged upper end 11, when in inoperative position, to close the upper end of the housing. In the exemplary embodiment, the sprinkler head includes an inner water receiving head chamber 32 having an inlet 33 and an outpuet 34. Outlet 34 is provided with internal threads to receive the externally threaded nozzle 29. Nozzle 29 may be adjusted inwardly or outwardly of the chamber 32 relative to the inlet 33 to adjust the size and shape of the water stream ejected therefrom. The force of water flowing into the chamber 32 causes the sprinkler head to pop-up into the operative position shown in FIG. 1.

The sprinkler body, indicated generally at 35, includes a main water passage means or tube 36 which supplies water to the sprinkler head chamber 32. Main water tube 36 is received at its upper end within a socket of the sprinkler head formed by the depending annular wall 37. A set screw 38 may be employed to allow adjustably rotating the sprinkler head upon the main water tube 36.

Means for mounting the sprinkler body for rotation and vertical axial sliding movement are provided to allow the sprinkler head to pop-up and rotate during a sprinkling operation. In the exemplary embodiment, such means include a rotatable drive sleeve 40 which is journaled at its lower reduced end 41 in the lower partition wall 23. The main inner bore of tubular drive sleeve 40 slidably receives the tubular main water tube 36. Pin 43, mounted on drive sleeve 40, rides within a vertical spline 44 in the main water tube 36 to allow vertical sliding movement of tube 36 within drive sleeve 40 while transmitting rotational movement of sleeve 40 to the main water tube 36. A drive gear 42, preferably integral with sleeve 40, is provided to be driven by the means for engaging and disengaging the fluid motor, indicated generally at 100, to rotate the sleeve 40.

A lower bore portion 45 of the sleeve 40 is enlarged to receive a laterally extending flange 46 on the lower end of water tube 36. Flange 46 abuts a seal and stop means 47 at the upper end of enlarged bore portion 45 of sleeve 40 to limit the upward sliding movement of the main water

tube 36 within the drive sleeve 40 when the sprinkler head pops-up.

The upper body portion of drive sleeve 40 is rotatably held within a mounting means supported by a partition wall. In the exemplary embodiment, such support means includes the tubular support member 48 rotatably journaled in the top partition wall 21. Support member 48 has a lower flange portion underlying partition wall 21 and is vertically constrained thereto by a removable snap ring 49 received in a groove 49' above the partition wall 21, as shown in FIG. 1.

Conventional O-ring seal means may be positioned between the partition wall 21 and surrounding side walls of inner housing 15, between partition wall 21 and the adjacent side walls of support member 48 and between the support member 48 and the sleeve member 40 received therein, all as illustrated in the exemplary embodiment of FIG. 1.

Fluid motor means are provided to drive the sleeve 40 through a transmission means to rotate the sprinkler head in an arcuate rotational movement. Such motor means, indicated generally at 50 in the exemplary embodiment, includes a water turbine means comprising a turbine plate 51 having a plurality of turbine blades 52, as best seen in FIGS. 1 and 3. Turbine plate 51 is rotatably mounted upon a turbine hub 53 which in turn is held by a set screw 54 to a spindle or shaft 55. Screws 56 may be used to hold the plate 51 to the underside of a flange 57 provided upon the hub 53.

Means for directing water from inlet 13 against the turbine blades 52 are provided to drive the fluid motor means. In the exemplary embodiment, such water directing means includes a plurality of passageways or turbine nozzles 58 provided in an inverted cup member 59 seated upon the bottom wall 25 of the inner housing 15. Water forced through the nozzles 58 from inlet 13 strikes the blades 52 and causes rotation of the turbine wheel or plate 51.

Water pressure reducing means are provided to selectably reduce the pressure of water entering the housing 15 from the inlet 13 prior to its passage through the nozzles 58 to impinge upon the turbine blades 52. As seen in FIGS. 1 and 5, the pressure reducing means, indicated generally at 60 in FIGS. 1 and 5, in the exemplary embodiment includes the ported pressure reducing plate means 61. Plate means 61 is provided with reduced diameter ports 62 which may be aligned to larger ports 63 in the bottom wall 25 of the inner housing 15.

Means are provided to rotatably mount plate 61 upon a hub 64, held by screws 65 to the bottom wall 25, to allow rotation thereof to alignment of ports 62 and 63. Hub 64 is provided with an inner reduced portion 66 which is received within a mating opening provided in the bottom wall 25 to locate the hub thereon. Plate 61 is centrally ported to freely rotate about the central body portion of hub 64 and is held thereon by the hub flange 67.

Manual means for rotating the pressure reducing means are provided including, as best seen in FIG. 5, a gear segment 68 formed in plate 61 which is engaged by a pinion 69. Manipulation of pinion 69, by means hereinafter described, rotates the pressure reducing plate 61 relative to the inner housing base 25. The reduced diameter ports 62 may thereby be aligned with the larger ports 63 to give a minimum pressure reducing effect. Rotation of plate 61 to mis-align ports 62 with ports 63 tends to close the openings therethrough which increases the pressure reducing effect thereof.

Speed regulating means are provided for selectably regulating the speed of arcuate rotation of the sprinkler head, indicated geenrally at 30, and its associated body portion, indicated generally at 35. Since the sprinkler head, indicated generally at 30, is driven by the fluid motor means, indicated generally at 50, through the gear train means and clutch means as hereinafter described, the

speed of arcuate rotation of the sprinkler head can be varied by regulating the amount of water directed against the turbine blades **52** to the turbine nozzles **58**.

The speed regulating means, indicated generally at **70** in the exemplary embodiment includes the provision of a plurality of by-pass passages **71** in the cap member **59** to align with by-pass ports **72** provided in the turbine plate **51** as best seen in FIG. 3.

Water entering the housing inlet **13** first passes through the pressure reducing means including the ports **62** and **63** into the chamber formed between the inverted cup member **59** and base **25**. The flow of water is then directed through the passages **58**, as aforedescribed, against the turbine blades **52**. In order to reduce the speed of rotation of the turbine wheel or plate **51**, some of the water from inlet **13** may be by-passed through the additional ports or by-pass passages **71** through the rotating by-pass ports **72** in plate **51**, without imparting rotation thereto. The amount of water being by-passed around the nozzles **58** is regulated by the provision of a ported regulator plate means, as plate **73** which has a plurality of ports **74** adapted to align with the by-pass passages **71**, as best seen in FIG. 4.

Means are provided for rotatably mounting the regulator plate **73** for selective rotation relative to the stationary by-pass passages **71**. Such means in the exemplary embodiment includes the hub **75** having an inner reduced diameter portion received within a mating opening in the base of cup **59** and held thereto by the screws **76**. Regulator plate **73** is centrally ported to allow it to freely rotate about the central body portion of the hub **75** and is held thereto by the hub flange **77**. As best seen in FIG. 4, the regulator plate is provided with a gear segment **78** projecting outwardly therefrom to engage and be driven by a pinion **79**. By selectively rotating pinion **79**, the regulator plate **73** may be selectively positioned to allow a desired amount of by-passing of water flow past the nozzles **58** to reduce the speed of rotation of the turbine wheel, and consequently that of nozzle head.

Means are provided for manually rotating the pinions **69** and **79** to rotate the pressure reducing plate **61** and the speed regulator plate **73**, respectively, as desired. Such means may be constructed indentically for the manipulation of each of the pinions **69** and **79** so that only a single exemplary embodiment of such means will be described herein. It is to be understood that the pinion manipulating means now described is to be duplicated in the exemplary embodiment of FIGS. 1 through 10.

Referring to FIG. 11, the pinions **69** and **79** are represented by or equivalent to the pinion **130**. A vertical shaft **131** is attached thereto and extends upwardly of the top partition wall **21** where a slotted head **132** is secured thereto. By inserting a screwdriver in the slot **133** and thereby rotating the rod **131**, the associated pinion, such as pinion **69** or **79** in FIGS. 4 and 5, and the pinion **130** in the exemplary embodiment of FIG. 11, can be rotated to drive the associated gear segment, as the exemplary segment **134** in FIG. 11.

Transmission means are provided for transmitting the power developed by the fluid motor means to the sprinkler mounting means including the sleeve **40**. Such transmission means in the exemplary embodiment includes a gear train means and a clutch means.

Gear train means are provided for transmitting power from the fluid motor means, indicated generally at **50**, to the clutch mechanism indicated generally at **100**, in FIG. 1. Such gear train means, in the exemplary embodiment, are indicated generally at **80** in FIGS. 1, 2, 3 and 6. Referring first to FIGS. 1 and 3, the gear train means includes a gear housing **81** mounted by an extension of housing **81** from wall **23** and held therein by set screw **82'**. A pinion **83** is mounted on the upper end of shaft or spindle **55** within the housing **81** where it is not contacted by the water flowing toward the main water passage or tube **36**.

Pinion **83** drives a gear **84**, within housing **81**, the gear **84** being fixed upon a vertical shaft **85**. Shaft **85** extends upwardly through the housing upper portion **82** and wall **23** in the gear chamber **27**. Within gear chamber **27**, there is provided a pinion **86** mounted upon the upper end of shaft **85** and fixed thereon by a pin **87**, as best seen in FIG. 6.

A first speed reducing gear **88** having large and small gear portions **89** and **90** is provided on a non-rotatable shaft or stud **91** supported from the lower partition wall **23**. The large gear portion **89** is driven by the pinion **86**. A second speed reducing gear **92** is provided with large and small gear portions **93** and **94**, respectively, upon the non-rotatable shaft or stud **95** supported from the lower partition wall **23**. The large gear portion **93** of speed reducing gear **92** engages the small gear portion **90** of the first speed reducing gear **88**. The small gear portion **94** of the second speed reducing gear drives a large first drive gear **96**.

Power as transmitted from gear **96** through the clutch means, indicated generally at **100**, to selectively rotate the sprinkler body, indicated generally at **35**, and the associated sprinkler head, indicated generally at **30**.

Clutch means are provided to selectively rotate the nozzle head, indicated generally at **30**, in an arcuate path using the power generated by the passage of water through nozzles **58** against the fluid motor means, indicated generally at **50**, and transmitted to the clutch means by the aforedescribed gear train means. If a full cycle sprinkler is required and reversing of the rotation of the sprinkler head is not deemed necessary, the gear **96** may be adapted to directly drive the drive sleeve **40** through the gear **42**, preferably integral with sleeve **40**. However, where it is desired to have a part cycle or reversing arcuate travel of the sprinkler head, indicated generally at **30**, as in the exemplary embodiment, a reversing clutch means is provided to effect a reversal of the power transmission to the power sleeve gear **42**. Such reversing clutch means, in the exemplary embodiment, is indicated generally at **100** in FIG. 1 and is shown in detail in FIGS. 6 through 9.

As best seen in FIG. 6, a first clutch drive mechanism includes the first drive gear **96** mounted to, and preferably integral with, a sleeve portion **97** fitted over a first clutch shaft **98** and held thereto by the pin **99**. A first driven clutch part **105** is mounted on a sleeve **106** rotatably mounted about the first clutch drive shaft **98** and seated upon the sleeve **97**. A pinion **107** is integral with sleeve **106** to rotate gear **42** in response to rotation of the first driven clutch part **105**.

A second clutch drive mechanism includes a second drive gear **101** which is mounted to, and preferably integral with, a second sleeve **102** mounted upon a second clutch drive shaft **103** and held thereto by the pin **104**. A second driven clutch part **108** is mounted to a sleeve **109** rotatably mounted about the second clutch drive shaft **103** and seated upon the sleeve portion **102** which is supported by the partition wall **23**. A pinion **110** is integral with the sleeve **109** to rotate gear **42** in response to rotation of the second driven clutch **108**.

Second drive gear **101** is driven by the first drive gear **96**, the two gears **96** and **101** rotating in opposite directions as shown by arrows in FIG. 2. By selectively interconnecting the clutch drive mechanisms, including drive shafts **98** or **103**, with the drive sleeve gear **42**, the drive sleeve, and consequently the sprinkler head, can be selectively operated in different rotational directions as hereinafter explained.

The clutch driven parts **105** and **108** are free to rotate relative to the partition wall **22** and are axially aligned relative to each other by the provision of a bracket **111** received in the first clutch part **105** and second clutch part **108**, respectively.

Clutch driving parts are provided in each drive mechanism upon the upper portions of the clutch drive shafts 98 and 103 as shown in FIG. 6. Each such clutch drive part 114 and 115 is provided with an internal bore 116 and 117, respectively, by which it is slidably mounted on the upper end of the associated clutch drive shaft. First clutch drive part 114 is provided with a slot 118 through which a flattened upper end 119 of drive shaft 98 protrudes to allow vertical movement of part 114 relative to shaft 98 but which prevents relative rotation therebetween. Similarly, the second clutch drive part 115 is provided with a slot 120 to receive an upper flattened end 121 of shaft 103 to allow sliding movement of part 115 on shaft 103 but which also prevents relative rotation therebetween.

Each clutch drive part 114 and 115 is provided with a lower clutch face adapted to mate with an associated clutch face on the driven parts to selectively drive the driven parts 105 and 108, respectively. While any conventional clutch facing may be employed between these drive and driven clutch parts, in the exemplary embodiment, ratchet, tooth-type clutch faces 122, 123, 124 and 125 are provided upon each of the clutch parts 114, 105, 115 and 108, respectively.

From the foregoing, it can be seen that when drive clutch part 114 is in a lowered position so that its clutch face 122 engages driven clutch part face 123, the rotation of gear 96 will be transmitted through shaft 98, to clutch part 114, through the clutch faces 122 and 123, to driven clutch part 105, sleeve 106 and pinion 107 to the gear 42 on the drive sleeve 40. The direction of rotation of gear 42 can be reversed by raising the first clutch drive part 114 and lowering the second clutch drive part 115.

On raising of first clutch part 114 and lowering of the second clutch drive part 115 to engage clutch faces 124 and 125, the drive power of gear 96 is transmitted through gear 101, sleeve 102, shaft 103, clutch drive part 115, clutch faces 124 and 125, driven clutch part 108, sleeve 109 and pinion 110 to the gear 42. Since gear 101 is driven in the oposite direction of gear 96, the rotation of pinion 110 through the second clutch drive means reverses the rotation of gear 42 from that imparted to it by the pinion 107 and the first clutch drive means.

Means are provided for selectively engaging the drive and driven clutch parts of the aforedescribed first and second clutch drive mechanisms in response to rotation of the sprinkler body. In the exemplary embodiment, such means, indicated generally at 140 in FIGS. 6 and 7, include a clutch drive part actuator means or blade 141 pivotally mounted upon a shaft 142 between the clutch drive parts 114 and 115. Actuator 141 has a central yoke shaped portion overlying the shaft 142 and outwardly directed actuator blades 143 and 144. Blades 143 and 144 project into grooves 145 and 146 provided in the parts 114 and 115, respectively. Actuator 141 is fastened to the shaft 142 by the screw 147 as seen in FIGS. 6 and 8.

Actuator shaft 142 is pivotally mounted between the clutch drive parts 114 and 115, as best seen in FIG. 8, in the side walls 148 and 149 of the U-shaped bracket 111.

As best seen in FIGS. 8 and 9, one end of the actuator shaft 142 is provided with an enlarged flanged end or disc 150. Flanged end or disc 150 is provided with a slot or notch 151, as best seen in FIG. 9. Actuator shaft 142 is rotated by movement of a pin 152 received in slot 151, as hereinafter explained, to selectively engage or disengage the clutch drive parts 114 and 115, respectively.

Means are provided for moving the actuator means in response to rotation of the drive sleeve rotating the sprinkler head. A lever 153 is pivotally mounted on a shaft 154 journaled in the side walls 148 and 149 of the bracket 111 below the actuator shaft 142, as best seen in FIGS. 8 and 9. Pin 152 is pressed into the lower end of arm 155 of the lever 153, as seen in FIG. 9, to engage the slot 151 in the disc 150 associated with the actuator shaft 142 and actuator 141.

Lever 153 is provided with two lever arms 155 and 156. The lower lever arm 156 is provided at its outer end with a roller 157 to abut a spring biased cam member 158, as seen in FIGS. 6 and 7. Cam member 158 is mounted upon a spring arm 159 supported from its base 160 which is mounted on the intermediate wall 22. This lower lever arm moves the lever 153 past an otherwise dwell or dead spot due to the spring bias of spring arm 156.

Means are provided for engaging and moving the actuator lever 153 in response to rotation of the sprinkler head and body. In the exemplary embodiment, such means include a pin 161 depending from the rotatably mounted support member 48 and the pin 162 extending outwardly from the drive sleeve 40. Sleeve 40 and support member 48 rotate in unison to bring the pins 161 and 162, as best seen in FIGS. 6 and 7, into alternate engagement with the second upwardly extending lever arm 155, as seen in FIGS. 6, 8 and 9.

In operation, assuming the first clutch drive mechanism including drive and driven parts 114 and 105 thereof, to be driving the sleeve 40 by its gear 42 in a clockwise direction in FIG. 7, after a certain arcuate movement thereof, the drive sleeve pin 162 will engage the upper lever arm 155 and rotate lever 153 about its pivot point 154. Such pivotal movement of the lever 153 moves the pin 152 received in slot 151 of disc 150 to cause rotation of disc 150, the associated actuator shaft 142 and the actuator 141 itself. Such movement of lever 153 imparted by pin 162 is in a clockwise direction in FIG. 9.

The rotation thus imparted to the disc 150 in FIG. 9 is in a counter-clockwise direction. Since FIG. 9 shows the opposite end of the actuator 141, as viewed in FIG. 6, the rotation of the actuator in FIG. 6 is in a clockwise direction. Such actuation of actuator means 141 causes raising of the first clutch drive part 114 and disengagement of the first clutch drive mechanism, lowering of the second clutch drive part 115 and engagement of the second drive mechanism to reverse the direction of rotation of the sleeve 40 and support member 48. Opposite rotation of support member 48 continues until the pin 161 on member 48 engages lever 155 from the opposite side and moves it back to the position of FIGS. 6 through 9, whereby the first clutch mechanism drive is re-engaged.

The excess width of the slot 151 in relation to the diameter of pin 152 is provided to prevent the disengagement of the operating clutch mechanism until the roller 157 passes over the peak or dead spot upon the cam 158. The spring bias cam 158 then carries the lever 153 to cause final movement of pin 152 against the disc 150 to cause reversing of the clutch mechanism after the pins 161 or 162 have initiated the reversing operation.

Means are provided for adjusting the arc of rotation provided for the sprinkler head, indicated generally at 30. From the foregoing, it can be seen that the arc of rotation is dependent upon the spacing of pins 161 and 162, since such spacing determines movement of the lever 153 which causes reversing of the sprinkler head rotation. The spacing of pins 161 and 162 may be adjusted by rotating the drive sleeve 40 relative to the support member 48.

In the exemplary embodiment, an exterior body sleeve 171 is slidably mounted on the outside of tubular support member 48. A pin 172 mounted in the exterior sleeve 171 engages a vertical spline or groove 173 provided in the tubular support member 48 to allow vertical sliding movement between sleeve 171 and support member 48 but which prevents rotation therebetween. Rotation of sleeve 40 is transmitted by pin 43 to the main water tube 36.

A disc 174 is keyed onto the main water tube 36 to rotate therewith as shown in FIG. 10. Disc 174 is re-

ceived within a recess **175** in the flange **176** of exterior body sleeve **171** as seen in FIG. 1. A large headed screw **177** is adapted to press the plate **174** tightly against flange **176** in the recess **175** to cause rotation of sleeve **171** with the body or tube **36** and sleeve **40**. Rotation of sleeve **171** is transmitted through pin **172** to the rotatable support member **48**.

It can be seen from the foregoing, that the relative positioning of the support member **48**, mounting pin **161**, to the position of sleeve **40**, mounting pin **162**, may be adjusted by loosening screw **177** and rotating the plate **174** relative to the exterior sleeve **171**. Such adjustment allows varying the spacing of pins **161** and **162** and thus the size of the arc of rotation imparted to the sprinkler head. Indicated generally at **30**.

Indicator means are provided for visually indicating the location and size of the arc of rotation for the sprinkler head. As hereinabove described, the positioning of plate **174** relative to the flanged exterior sleeve **171** determines the positioning and size of the arc of rotation for the sprinkler head of the exemplary embodiment, is shown in FIG. 10 and includes the provision of visually observable indicia upon the plate **174** and flange **176**.

As seen in FIG. 10, the flange **176** is provided with a reference point **179**. A scale in any desired increments of degrees is provided on the disc **174** as indicated generally at **178**. The arc of rotation for the sprinkler head is determined by the location of the disc **174** relative to the reference point **179** on flange **176**. The exemplary setting of plate **174** in FIG. 10 relative to the reference point **179** indicates an arc of rotation of 60° in a south-southwesterly direction, assuming north to be up in FIG. 10 and south to be down in FIG. 10.

From the foregoing detailed explanation of an exemplary embodiment of the sprinkler device in accordance with the present invention, it can be seen that the foregoing objects of the present invention have been attained. The arc of rotation for the sprinkler head, indicated generally at **30**, may be readily adjusted to any size angle and to any location by the relative adjustment and setting of sleeve **40** relative to the support member **48**. The setting of size and location of the arc or part cycle rotation for the sprinkler head is visibly indicated by the indicator means, indicated at **178** in FIG. 10, on the plate **174**.

In addition to easily adjusting the size and location of the arc of rotation of the sprinkler head even while it is operating, the sprinkler head **30** may be rotated to any position while the sprinkler is operating. Further, the speed of rotation of the sprinkler nozzle may be adjusted by manipulation of the means for rotating the speed regulator plate **73**. The by-passing of water through passages **71** by-passing the fan blades **52** of the motor means allows reducing the speed of rotation of the sprinkler head without reducing the water pressure reaching the sprinkler head. The length of the water stream ejected from the nozzle is thus not changed while the speed of rotation of the sprinkler head is varied.

The length of the stream of water ejected from the sprinkler head nozzle **29** may be varied by adjustment of the water pressure reducing means within the sprinkler, including the rotatable plate **61**. By manipulation of pressure reducing plate **61**, the water pressure at the sprinkler head, indicated generally at **30**, may be varied to adjust the length or size of the water stream ejected. A particular speed of rotation may be maintained in the exemplary embodiment while reducing the water pressure by operating the speed regulating means indicated at **70** to pass a greater amount of water to the turbine or fan blades **52** as the water pressure is decreased and, vice versa.

Having thus explained in detail an exemplary embodiment of the present invention, it should be noted by those skilled in the art that the embodiment thus described herein is exemplary only. Various modifications, adaptations, and variations of the exemplary embodiment may be made which come within the scope of the present invention which is defined by the following claims:

I claim:

1. In a sprinkler device including: a housing having a water inlet, a sprinkler head having a water outlet therefrom, a body portion mounting said head and providing a water passage to said head, and motor means operable by water flowing from said inlet to said passage, the provision of:

sleeve means for mounting said body portion;

means for rotatably mounting said sleeve means relative to said housing including a lateral support means about said sleeve means for laterally supporting portions of said sleeve means;

means for rotatably mounting said lateral support means relative to said housing;

means for adjustably connecting said sleeve means and lateral support means for common rotation thereof; and

transmission means connecting said motor means with said sleeve means to rotate said connected sleeve and support means in unison with said body portion and sprinkler head mounted thereon.

2. The provision of claim **1** wherein:

said transmission means includes reversible clutch means including first and second clutch drive mechanisms adapted to drive said sleeve means in opposite rotative directions;

clutch actuator means are provided for selectively operating said first and second clutch drive mechanisms; and

means are provided on said sleeve means and on said support means for engaging and operating said clutch actuator means in response to rotation of said sleeve and support means to cause reversal of rotation thereof.

3. The provision of claim **2** wherein said means for connecting are adjustable to allow rotation of said sleeve and support means relative to each other to select the positioning of said means for engaging and operating said clutch actuator means on said sleeve and support means and thereby adjust the arc of rotation of said sprinkler head between reversals of said sleeve rotation.

4. The provision of claim **3** including:

visually observable indicator means, associated with said means for connecting, for indicating the location and size of the arc of rotation for the sprinkler head determined by the positioning of said sleeve means relative to said support means.

5. The provision of claim **1** including:

adjustable water pressure reducing means adjacent said inlet for adjustably reducing the pressure of water received therefrom prior to its passing through the motor means.

6. The provision of claim **1** including:

motor speed reducing means for reducing the speed of rotation of the sprinkler head imparted by said motor means, said speed reducing means including water passages by-passing said motor means and means for selectively diverting water from said housing inlet to said passages by-passing said motor means.

7. The provision of claim **1** wherein said sleeve means for mounting said body portion includes means for allowing limited axial movement of said body portion with ing said sleeve means to allow said sprinkler head to pop-up upon introduction of water under pressure into said water passage to said head.

8. In a sprinkler device including a fluid motor means having inclined blades rotated by water flowing through the sprinkler to rotate an associated sprinkler head thereon, the provision of:

speed regulating means for regulating the speed of rotation of the associated sprinkler head including means for diverting a selectable amount of water to the sprinkler head by-passing the motor blades to control the speed of the motor means wherein said speed regulating means includes:

a plurality of by-pass ports in a portion of said motor means adjacent to and rotated with said blades;

means on said sprinkler providing water passages for directing water from an inlet to the sprinkler toward said by-pass ports;

ported plate means having a plurality of openings to align with said water passages; and

means for rotatably mounting said plate means between said water passages and said inlet to selectably by-pass water past said blades through said passages and by-pass ports by rotation of said plate means relative to said passages.

9. In a sprinkler device including: a housing having a water inlet, a sprinkler head having a water outlet therefrom and motor means operable by water flowing from said inlet to said outlet, the improvement comprising:

a sprinkler body portion mounting said sprinkler head and being telescopically received in and keyed to an axially stationary means, said axially stationary means being rotatably mounted within said housing;

transmission and two directional clutch means driven by said motor means and associated with said axially stationary means for rotating said sprinkler head alternately in opposite directions; and

means associated with said clutch means for adjusting the arc of rotation of said sprinkler head externally of said housing while said sprinkler device is in operation.

10. The improvement in sprinkler device of claim **9** wherein said means for adjusting the arc of rotation of said sprinkler head comprises:

an external body sleeve positioned about said body portion and telescopically mounted on and keyed to a

rotatably mounted support member positioned exteriorly of said axially stationary means and rotatable relative thereto, said axially stationary means being rotatably mounted relative to said housing and having said body portion keyed thereto for common rotation;

means for adjustably securing said external body sleeve to said sprinkler body portion externally of said housing when said sprinkler is in operation; and

means on each of said support member, associated with said external body sleeve, and said axially stationary means, associated with said sprinkler body portion, for engaging and operating means associated with said clutch means to reverse said clutch means in response to the relative positioning of said external body sleeve to said sprinkler body portion.

11. The improvement in sprinkler device of claim **10** wherein:

visually observable indicator means are provided for indicating the relative positioning of said body sleeve and said body portion to indicate the size of arc of rotation for said sprinkler head.

12. The improvement in sprinkler device of claim **9** wherein:

said sprinkler head is rotatably mounted upon said sprinkler body portions for rotational adjustment relative to said housing independent of the positioning of said body portion and means are provided for securing said sprinkler head to said body portion when in a desired adjusted position.

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EVERETT W. KIRBY, *Primary Examiner.*