May 22, 1962 W. S. KIMBRO ETAL 3,035,778

POP-UP SPRINKLERS

Original Filed June 9, 1958

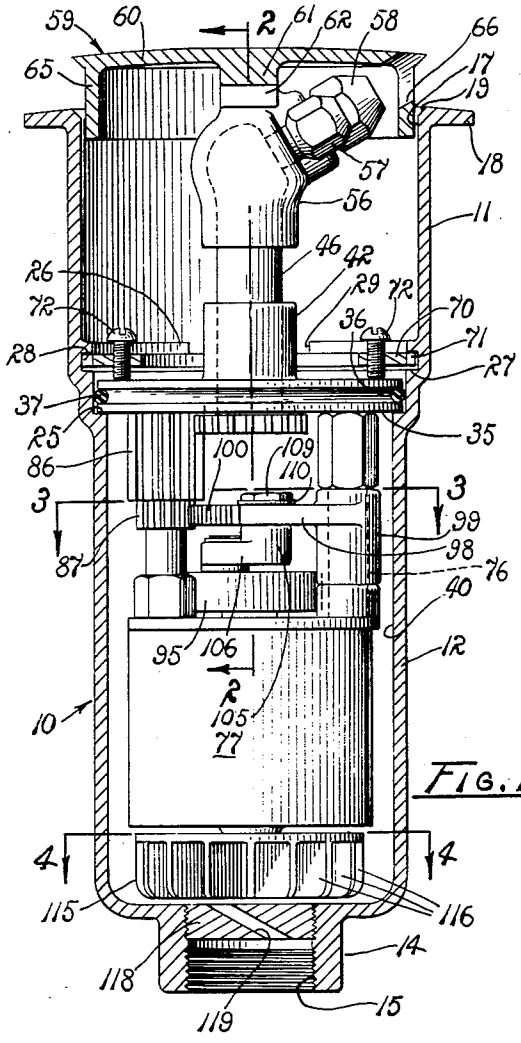


FIG. 1.

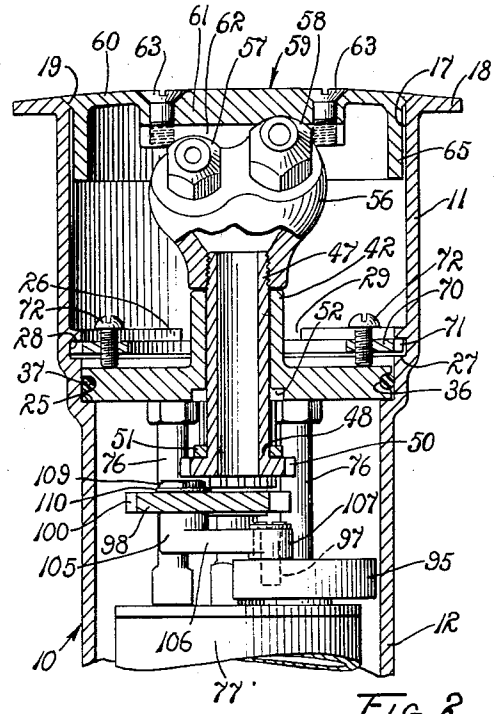


FIG. 2.

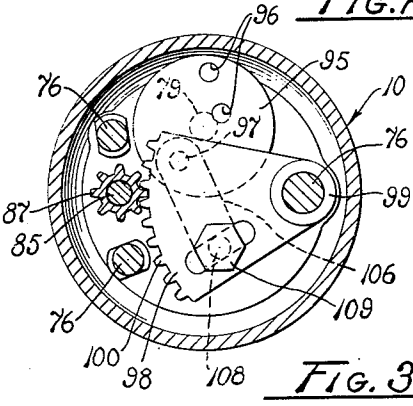


FIG. 3.

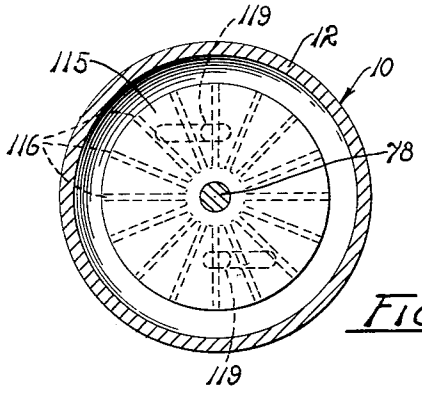


FIG. 4.

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United States Patent Office 3,035,778 Patented May 22, 1962

3,035,778

POP-UP SPRINKLERS

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Continuation of application Ser. No. 740,805, June 9, 1958. This application Mar. 13, 1961, Ser. No. 95,437

22 Claims. (Cl. 239—206)

The present invention relates to an oscillatory or rotational fluid sprinkler which is movable upwardly and downwardly in respect to a reference surface in which the sprinkler is mounted and which is commonly known as a pop-up type sprinkler. This application is a continuation of our co-pending application Serial No. 740,805, filed June 9, 1958, and which is entitled "Pop-Up Fluid Sprinklers," now abandoned.

The desirability and advantages of pop-up sprinklers are recognized. When such a sprinkler is not in use, it sets flush with the surface or slightly below the surface of the ground in which it is embedded to enable lawn mowing, to permit unrestricted use of the area for walking, playing, and the like, and so as not to detract from the appearance of the lawn. When in use, however, such a sprinkler is raised upwardly above the surface of the ground by water pressure to permit ejection of water onto the surrounding area in accordance with the predetermined irrigating pattern of the sprinkler. Many such pop-up sprinklers are non-rotatable but are designed continuously to eject water throughout 360° or various segments of a circle.

However, rotary pop-up sprinklers are also well-known which distribute water over an area completely circumscribing the sprinkler. Such sprinklers are usually designed to eject a more confined stream of water over a greater trajectory than the known non-rotatable types. In certain installations, however, it is desirable to employ these rotary sprinklers for irrigating relatively large segments of a circle. For example, it is known to employ several elevationally fixed above ground, impact driven oscillating sprinklers for watering a lawn. Usually these are arranged to irrigate overlapping or contiguous segments of a lawn and thereby provide a substantially uniform coverage. Such sprinklers are also used along curbs, sidewalks, and the like.

The prior art pop-up sprinklers designed to irrigate only a segment of a circle have not been satisfactory in many respects. Although it has been known to provide a pop-up sprinkler rotatable through 360 degrees with a valve designed to distribute water only over predetermined segments of a circle through which the nozzle rotates, the movement of the sprinkler nozzle is not controllable as in an oscillating sprinkler. Accordingly, oscillating pop-up sprinklers have not been available which move with substantially uniform speed, which operate satisfactorily notwithstanding the presence of foreign particles in the water, which are easily and quickly adjustable as to the arc or segment covered, which have a relatively long life, and which contain relatively few parts to maintain.

Therefore, it is an object of the present invention to provide a superior oscillating pop-up fluid distributing device.

Another object is to facilitate adjustment of the arc covered by an oscillating sprinkler.

Another object is to provide an oscillating sprinkler which travels at a substantially uniform rate of speed.

Another object is to provide an oscillating fluid sprinkler which operates satisfactorily notwithstanding the presence of minute particles of foreign substances in the water.

Another object is to provide a positively driven oscillating sprinkler.

Another object is to provide a sprinkler which is easily disassembled and assembled for repair, maintenance, replacement of parts, and the like.

Another object is to provide a sprinkler which is durable in construction, dependable in action, and which has a maximum life and a minimum of wearing parts.

Further objects are to attain the preceding objectives in a pop-up sprinkler.

These, together with other objects, will become more fully apparent upon reference to the following description and accompanying drawing.

In the drawing:

FIG. 1 is a longitudinal vertical section taken through a fluid sprinkler embodying the principles of the present invention.

FIG. 2 is a fragmentary longitudinal vertical section taken on a plane at a position represented by line 2—2 of FIG. 1.

FIG. 3 is a horizontal transverse section taken on a plane at a position represented by line 3—3 of FIG. 1.

FIG. 4 is a horizontal transverse section taken on a plane at a position represented by line 4—4 of FIG. 1.

Referring more particularly to the drawing, a fluid sprinkler of the type provided by the present invention is best illustrated in FIGS. 1 and 2 and includes an elongated generally cylindrical housing **10** having an upper end portion **11** of a predetermined diameter and a lower end portion **12** smaller in diameter than the upper portion. The housing also has an axially extended lower female receptacle **14** having internal threads and providing a fluid inlet **15** adapted for screw-threaded connection to a source of fluid under pressure, not shown. The upper end portion of the housing provides an upwardly disposed opening **17**, a radially outwardly extended flange **18**, and a frusto-conical upwardly divergent bevel **19** in circumscribing relation to the upper opening. The housing is designed to be embedded in the ground so that the upper flange is substantially flush with the surface or slightly below the surface of the ground.

Further considering the construction of the housing **10**, a lower annular ledge **25** is provided internally between the upper and lower end portions **11** and **12** of the housing. Vertically spaced upper and lower shoulders **26** and **27** in the upper end portion **11** of the housing define an annular upper groove **28** therebetween spaced upwardly from the ledge. At this point it is to be noted that the upper shoulder includes a plurality of segments in circumferentially spaced relation so as to provide a plurality of notches **29** therebetween longitudinally extended into the groove.

A circular spindle bearing support plate **35** provides an annular circumscribing channel **36** and is releasably rested on the ledge **25** in the housing **10**. An annular O-ring **37** of neoprene, or other suitable packing material, is fitted around the plate in the channel and is in fluid-tight engagement with both the plate and the housing to provide a fluid seal between the upper and lower end portions **11** and **12** of the housing. The plate and the lower end portion of the housing define a fluid chamber **40** into which the fluid inlet **15** admits water from the source, not shown, but discussed above. A cylindrical tubular spindle bearing **42** is integrally coaxially upwardly extended from the support plate.

An elongated fluid conducting tubular spindle **46** is concentrically rotatably and axially slidably journaled in the spindle bearing **42** and provides upper and lower ends **47** and **48** respectively extended above and below the plate **35**. A circular spindle gear **50** is integrally secured to the lower end **48** of the spindle within the chamber **40**, and a washer **51** is fitted on the spindle between the bearing plate and the spindle gear. The spindle is longitudinally slidable between an upper fluid ejecting

position, as shown in FIG. 1, and a lower retracted position, as shown in FIG. 2. Preferably, the plate has a downwardly disposed annular recess **52** adapted to receive the spindle gear when the spindle is slid upwardly in the bearing so that when the spindle gear engages the bottom side of the plate, the spindle is precluded from further movement upwardly.

A sprinkler head **56** is screw-threadably mounted on the upper end **47** of the spindle **46** and provides upwardly outwardly extended inner and outer nozzles **57** and **58**. A housing cover **59** provides a generally circular upper wall **60** circumscribed by a frusto-conical rim, a center boss **61** downwardly extended from the wall centrally thereof and secured to a bar **62** on the sprinkler head by means of screws **63**. The cover also has an annular skirt **65** circumscribing the boss and the nozzles and providing a port **66** in registration with the nozzles. It will be evident that the open lower end **48** of the spindle **46** admits fluid under pressure from the chamber into the spindle whereupon it passes under pressure through the sprinkler head and outwardly from the nozzles through the port. The cover is adapted for movement between a retracted position with the rim of its wall **60** complementarily seated in the bevel **19** of the upper opening **17** of the housing whereupon the port is closed by the upper end portion of the housing, as illustrated in FIG. 2, and an upwardly extended fluid ejecting position, as illustrated in FIG. 1, with the port exposed above the flange **18** of the housing. The cover moves upwardly and downwardly with the spindle inasmuch as it is rigidly connected thereto. Elevational movement of the spindle and the cover is caused by the pressure of water in the chamber bearing upwardly against the effective area of the spindle gear **50**, representing the difference between the area of total exposed lower surface and the smaller upper surface of the gear. The upward component of the force of the water pressure exerted within sprinkler head **56** and the restriction to flow caused by nozzles **57** and **58** assist in lifting the spindle and maintaining it in an elevated position as long as water under pressure is admitted through fluid inlet **15**.

An annular lock ring **70** circumscribes the spindle bearing **42** and provides a plurality of tongues **71** radially outwardly extended into the groove **28** and rotatably slidable therein between a releasing and inserting position in registration with the notches **29** and a locked position between the upper and lower shoulders **26** and **27**. A plurality of screws **72** are screw-threaded downwardly through the lock ring and have lower ends engaging the upper surface of the bearing support plate **35**. It will be evident that by tightening the screws, the bearing support plate is dependably held downwardly against the ledge **25** and in fluid-tight engagement with the housing **10**. In this manner, the parts of the sprinkler are easily assembled and disassembled and yet when assembled, the support plate is in fluid sealing relationship with the housing so as to prevent leakage of fluid from the chamber **40** into the upper end portion **11** of the housing.

A plurality of support posts **76** are rigidly downwardly extended from the support plate **35** in generally triangular relationship with the axis of the spindle **46** in the center of such a triangle formed by the posts. A cylindrical gear box **77** is connected to and borne by the posts within the chamber and is in circumferentially spaced relation to the housing, as indicated in FIGS. 1 and 2. The gear box provides an input shaft **78** downwardly extended concentrically of the housing and an output drive shaft **79** upwardly extended in axially offset relation to the spindle **46**, as best seen in FIGS. 2 and 3. The gear box is designed to effect gear reduction between the input shaft and the output shaft and although not shown, preferably includes a spur gear train having a gear reduction of 1700 to one, that 1700 revolutions of the input shaft is required to effect a single revolution of the output shaft. Inasmuch as such gear reduction mechanisms are well-known, no further description is provided. It is important to note, however, that the gear reduction box provides a fluid-tight housing for the gears or other reduction mechanism enclosed therewithin inasmuch as the box is submerged in fluid within the chamber **40** during operation of the sprinkler.

An elongated pin **85** is rigidly downwardly extended from the plate **35** between a pair of posts **76**. An upper elongated spindle driving gear **86** having gear teeth extended longitudinally of the housing in substantially parallel relation to the gear teeth of the spindle gear **50** is rigidly mounted on the pin and is in mesh with the spindle gear, as indicated in FIG. 1. A driven pinion **87** is secured to the lower end of the driving gear and is slightly diametrically smaller than the driving gear.

A circular driving wheel **95** is concentrically secured to the output shaft **79** and includes a plurality of holes **96** in radially spaced relation to the output shaft. An eccentric coupling pin **97** is provided for connection to the wheel in any one of the holes **96**.

A segment gear **98** of generally triangular configuration includes a hub **99** rotatably mounted on one of the posts **76** for oscillating movement about an axis offset from the axes of the output shaft **79** and the spindle **46** but in substantially parallel relationship therewith, said spindle gear axis being further in substantially diametrically opposed relationship, with respect to the housing **10**, from the axis of the pin **85**. The segment gear provides teeth **100** concentric to the axis of oscillation of the gear and in mesh with the driven pinion **87**. Further, the segment has an elongated radially disposed slot **101**.

A crank **105** provides an elongated arm or pitman **106**, an eyelet **107** integral with the arm and rotatably fitted on the pin **97**, and a stud **108** integral with the arm at the opposite end thereof from the eyelet extended through the slot **101** in the segment gear **98**. The stud is connected to the segment gear by a nut **109** screw-threaded on the stud. Preferably a washer **110** is interposed the segment gear and the nut **109**. It will be evident that rotation of the driving wheel **95** causes oscillation of the segment gear **98** through the crank **105**. Oscillatory movement of the segment gear is transmitted to the spindle gear **50** through the pinion **87** and the drive gear **86**. The angular extent of oscillation of the segment gear is controlled by adjusting the connecting points of the crank to the segment gear, by means of the slot **101** and the nut **109**, and to the wheel by means of the concentric pin and the holes **96**.

An impeller **115** is connected to the input shaft **78** and provides a plurality of blades **116** radially outwardly extended in opposed relation to the inlet **15** of the housing **10**. A motor block **118** is screw-threaded into the receptacle **14** and provides a pair of elongated generally diametrically related fluid bores **119** oppositely upwardly extended in acute angular relation with a vertical plane containing the axis of the housing. Fluid forced under pressure upwardly through the bores strikes the blades of the impeller to impart rotation to the input shaft **78**.

Operation

The operation of the described embodiment of the subject invention is believed to be readily apparent and is briefly summarized at this point.

With the sprinkler embedded in the ground in a substantially vertical position, the cover **59** seats in the upper end portion **11** of the housing **10** when there is no water pressure applied to the inlet **15**.

Assuming that the crank **105** has been connected in such a manner to the drive wheel **95** and to the segment gear **98** so as to provide the desired extent of angular movement of the segment gear, the sprinkler is ready for operation. Of course, any such adjustments are made before the parts are assembled into the housing **10**. When water under pressure is admitted into the inlet **15**, it

passes upwardly through the bores **119** and strikes the blades **116** of the impeller **115** to rotate the input shaft **78**. This very slowly rotates the output drive shaft **79** and thus the driving wheel **95**. The spindle gear **50** and thus the spindle **46** are oscillated through the predetermined angle by the oscillation of the segment gear **98**. Accordingly, the nozzles **57** and **58** are similarly oscillated.

As explained above, water pressure acting upon the effective difference of area of the lower surface of gear **50** exerts an upward force on the spindle **46**. Further, water from the inlet **15** enters the chamber **40**, passes upwardly through the spindle **46**, and because of its restriction by the nozzles **57** and **58** forces the spindle and associated parts upwardly. This lifts the cover **59** upwardly to expose the port **66**. Water is then ejected by the nozzles through the port over the area predetermined by oscillatory adjustment.

When the water pressure is relieved, the oscillatory movement of the sprinkler nozzles **57** and **58** ceases and the spindle **46** gravitationally slides downwardly in the spindle bearing **42** whereupon the cover **59** once again seats in the upper end portion **11** of the housing **10**. It is to be noted that upward and downward slidable movement of the spindle is permitted by the longitudinally slidable engagement of the spindle gear **50** and the driving gear **86**.

It is to be noted that the sprinkler mechanism within the chamber **40** is easily removed first by removing the cover **59** after unthreading the screws **63**. Then by loosening the screws **72** and twisting the lock ring **70** until the tongues **71** register with the notches **29**, the internal parts of the sprinkler can be taken out of the housing by lifting upwardly on the sprinkler head **56**. The device is of course reassembled by following a reverse procedure.

From the foregoing it will be evident that an oscillating sprinkler of the pop-up type has been provided which is readily adjustable as to the extent of angular movement traveled, which moves at a substantially uniform or steady speed, which distributes water, pops-up, and oscillates satisfactorily notwithstanding the presence of foreign matter in the water, and which is dependable in action and easy to maintain and repair. Further, the sprinkler has adequate means for protecting the internal moving parts thereof and is provided with dependable fluid seals where required. It has been found in practice that a sprinkler constructed in accordance with the principles of the present invention has a long life and a minimum of wearing parts.

Although the invention has been herein shown and described in what is conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of the invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent devices and apparatus.

Having described our invention, what we claim as new and desire to secure by Letters Patent is:

1. In an oscillating pop-up sprinkler, an elongated housing providing a chamber and having an inlet to the chamber adapted for connection to a source of fluid under pressure, a support mounted in the housing, an elongated tubular fluid conducting spindle rotatably and axially slidably mounted in the support having a driven fluid inlet and extended into and communicating with the chamber and an opposite fluid outlet, an oscillating member mounted on the support in the chamber for oscillatory movement about an axis substantially parallel to the spindle, interengaging means on the driven end of the spindle and on the oscillating member slidable relative to each other longitudinally of the housing thereby to accommodate axial sliding movement of the spindle in the support, said means interconnecting the oscillating member and the spindle for oscillating the spindle incident to oscillatory movement of said oscillating member, and powered means mounted on the support within the chamber having driving connection to the oscillating member for oscillating said member about its axis.

2. In an oscillating sprinkler, an elongated housing providing a chamber having an inlet to the chamber adapted for connection to a source of fluid under pressure, a support mounted in the housing, an elongated tubular fluid conducting spindle rotatably and axially slidably mounted in the support having a driven fluid inlet end extended into and communicating with the chamber and an opposite fluid outlet, a shaft, means mounting the shaft on the support in the chamber and in axially offset relation to the spindle and for imparting rotation to the shaft, an oscillating member mounted on the support in the chamber for oscillatory movement about an axis substantially parallel to the spindle, interengaging means relatively slidable longitudinally of the spindle and interconnecting the oscillating member and the driven end of the spindle for oscillating the spindle incident to oscillatory movement of said oscillating member, and second linkage means interconnecting the shaft and the oscillating member for oscillating said member upon rotation of the shaft.

3. In an oscillatory fluid distributing device, an elongated housing providing a chamber having an end adapted for connection to a source of fluid under pressure, and an opposite end, a support plate mounted in the housing intermediate its ends, an elongated tubular fluid conducting spindle rotatably and axially slidably mounted in the support plate having a fluid inlet communicating with the chamber and an opposite fluid outlet adjacent to said opposite end of the housing, a segment gear mounted on the support plate for oscillation on an axis offset from the spindle, a spindle gear connected to the spindle, a spindle driving gear in mesh with the spindle gear and rotatably borne by the support plate, the spindle gear and the driving gear being axially slidably engaged while remaining in continuous mesh, means providing geared interconnection of the segment gear and the spindle driving gear for oscillating the spindle incident to oscillation of the segment gear, powered means borne by the support plate having a rotary output shaft, a driving member rigidly secured to the shaft for rotation therewith, and rigid linkage means pivotally interconnecting the segment gear and the drive member in radially spaced relation to the shaft for oscillating the segment gear upon rotation of the output shaft.

4. In an oscillatory fluid sprinkler, an elongated upstanding housing having an upper open end and a lower fluid inlet concentric to the housing and adapted for connection to a source of fluid under pressure, a support plate mounted transversely in the housing, means circumscribing the plate in annular fluid-tight relation therewith and with the housing to define a fluid chamber therebelow in communication with said fluid inlet, an elongated fluid conducting tubular spindle rotatably journaled in the plate having an upper end above the plate and a lower fluid inlet end below the plate, a fluid discharge nozzle connected to the upper end of the spindle and directed upwardly out of the upper end of the housing, a drive shaft mounted by the plate in the chamber eccentrically of the spindle, a driving wheel concentrically secured to the drive shaft for unitary rotation therewith, an elongated spindle driving gear rotatably supported by the plate within the chamber in axially offset relation to the spindle and to the shaft, a driven pinion coaxially secured to the driving gear, a spindle gear concentrically secured to the lower end of the spindle in mesh with the spindle driving gear, a segment gear having a hub rotatably borne by the plate in the chamber for oscillatory movement about an upstanding axis substantially diametrically related to the axis of the pinion on the opposite side of the spindle from said pinion and having gear teeth in mesh with the pinion for imparting oscillatory movement thereto, a crank having opposite ends pivotally connected to

the segment gear and to the wheel in radially spaced relation to the output shaft for oscillating the segment gear incident to rotation of the shaft, and powered means borne by the plate and connected to the drive shaft for imparting rotation thereto.

5. In an oscillatory pop-up fluid sprinkler, an elongated upstanding cylindrical housing having an upper open end and a lower fluid inlet concentric to the housing and adapted for connection to a source of fluid under pressure, a spindle bearing support plate mounted transversely of the housing, a seal circumscribing the plate in annular fluid-tight relation therewith and with the housing to define a fluid chamber therebelow in communication with said fluid inlet, a cylindrical tubular bearing integrally axially upwardly extended from the plate, an elongated fluid conducting tubular spindle rotatably and axially slidably journaled in the bearing having an upper end above the plate and a lower fluid inlet end below the plate, a fluid discharge nozzle connected to the upper end of the spindle and directed upwardly out of the upper end of the housing, a plurality of posts borne by and downwardly extended from the plate, a gear reduction unit mounted on the posts including an input shaft concentric to the housing adapted to rotate at a predetermined speed and an output shaft eccentrically of the spindle adapted to rotate at a speed less than that of the input shaft, a driving wheel concentrically secured to the output shaft for unitary rotation therewith, an elongated spindle driving gear rotatably supported by the plate within the chamber in axially offset relation to the spindle and to the output shaft, a driven pinion coaxially secured to the driving gear, a spindle gear concentrically secured to the lower end of the spindle in mesh and in longitudinal sliding engagement with the spindle driving gear, a generally triangular segment gear having an apex hub rotatably mounted on one of the posts for oscillatory movement about an upstanding axis substantially diametrically related to the axis of the pinion on the opposite side of the spindle from said pinion, a crank having opposite ends adjustably pivotally connected to the segment gear and to the wheel in radial relation to the output shaft for oscillating the segment gear incident to rotation of the input shaft, an impeller concentrically mounted on the input shaft, and a motor block fitted in said fluid inlet having a pair of generally diametrically related fluid bores oppositely upwardly extended in acute angular relation with a vertical plane whereby fluid passing upwardly under pressure through the bores strikes said impelier to impart rotation thereto and to said input shaft whereby the spindle is oscillated by the segment gear, the fluid entering said bores filling the chamber and applying pressure to the spindle gear to raise the spindle in said bearing, said fluid further entering the inlet end of the spindle and passing upwardly and out of said nozzle.

6. The sprinkler of claim 5 including a substantially circular cover having a central boss secured to the nozzle and an annular skirt circumscribing the boss and fitted within the open upper end of the housing for elevational movement between a lower position covering the upper open end of the housing and an upper position upwardly spaced from said lower position, the skirt providing a port therein registering with the nozzle, the port being concealed within the housing when the cover is in said lower position and being exposed when in said upper position.

7. The sprinkler of claim 5 wherein said plate has an annular channel, and said seal is an O-ring of resiliently compressible material fitted in the channel in fluid-tight engagement with the plate and the housing.

8. The sprinkler of claim 5 wherein the housing has an internal annular ledge on which the bearing plate is rested, wherein the housing also has annular vertically spaced upper and lower shoulders radially inwardly extended above the plate providing an annular groove therebetween, the upper shoulder having a plurality of segments providing a plurality of peripherally spaced notches therebetween extended into the groove, an annular lock ring circumscribing the spindle having radially outwardly extended tongues rotatably slidably fitted in said groove and being registerable with said notches to enable insertion and release of the ring, and upstanding screws screw-threaded downwardly through the lock ring and bearing against the plate releasably to hold the plate against the ledge.

9. In a fluid distributing device, an elongated housing providing a chamber having an end adapted for connection to a source of fluid under pressure, and an opposite end; a support plate mounted in the housing intermediate its ends and providing a bearing coaxial with the housing; an elongated tubular fluid conducting spindle rotatably and axially slidably mounted in the bearing having a fluid inlet communicating with the chamber and an opposite fluid outlet adjacent to said opposite end of the housing; an elongated spindle driving gear having an axis of rotation; means mounting the spindle driving gear in the housing for rotation about its axis of rotation and in axially offset relation to the bearing; a spindle gear rigidly connected to the spindle and being in longitudinally slidably meshing engagement with the spindle driving gear to accommodate longitudinal sliding movement of the spindle in the bearing relative to the spindle driving gear; and means mounted in the housing having driving connection to the spindle driving gear for imparting turning movement to the spindle driving gear about its axis of rotation.

10. In a fluid distributing device, a housing providing a chamber and being adapted for connection to a source of fluid under pressure; an elongated tubular fluid conducting spindle; means rotatably and axially slidably mounting the spindle in the housing in fluid communication with the chamber and guiding the spindle in predetermined attitude with respect to the housing during axially slidable movement thereby; a spindle driving gear; means mounting the spindle driving gear in the housing for rotation about an axis in axially offset substantially parallel relation to the spindle; a spindle gear rigidly connected to the spindle and in longitudinally slidably meshing engagement with the spindle driving gear to accommodate longitudinally sliding movement of the spindle in the bearing relative to the spindle driving gear; and means mounted in the housing having driving connection to the spindle driving gear for imparting turning movement thereto.

11. In an oscillatory fluid sprinkler, an elongated upstanding housing having an upper open end and a lower fluid inlet adapted for connection to a source of fluid under pressure, a support plate mounted transversely in fluid-tight relation with the housing to define a fluid chamber therebelow in communication with said fluid inlet, an elongated fluid conducting tubular spindle rotatably journaled in the plate for axially slidable movement having an upper end above the plate and a lower fluid inlet end below the plate, a fluid discharge nozzle connected to the upper end of the spindle and directed upwardly out of the upper end of the housing, a drive shaft supported by the plate in the chamber eccentrically of the spindle, a driving wheel concentrically secured to the drive shaft for unitary rotation therewith, an elongated spindle driving gear rotatably supported by the plate within the chamber in axially offset relation to the spindle and to the shaft, a driven pinion coaxially secured to the driving gear, a spindle gear concentrically secured to the lower end of the spindle in mesh with the spindle driving gear, the spindle gear and the driving gear being axially slidable with respect to each other while remaining in continuous mesh, a segment gear having a hub rotatably borne by the plate in the chamber for oscillatory movement about an upstanding axis substantially diametrically related to the axis of the pinion on the opposite side of the spindle from said pinion and having gear teeth in mesh with the pinion for imparting oscillatory movement thereto, a crank having opposite ends pivotally connected

to the segment gear and to the wheel in radially spaced relation to the drive shaft for oscillating the segment gear incident to rotation of the shaft, and powered means borne by the plate and connected to the drive shaft for imparting rotation thereto.

12. In an oscillatory fluid sprinkler, an elongated upstanding housing having an upper open end and a lower fluid inlet adapted for connection to a source of fluid under pressure, a support plate mounted transversely in fluid-tight relation with the housing to define a fluid chamber therebelow in communication with said fluid inlet, an elongated fluid conducting tubular spindle rotatably journaled in the plate for axially slidable movement and having an upper end above the plate and a lower fluid inlet end below the plate, a fluid discharge nozzle connected to the upper end of the spindle and directed upwardly out of the upper end of the housing, a drive shaft supported by the plate in the chamber eccentrically of the spindle, an elongated spindle driving gear rotatably supported by the plate within the chamber in axially offset relation to the spindle and to the shaft, a driven pinion coaxially secured to the driving gear, a spindle gear concentrically secured to the lower end of the spindle in mesh with the spindle driving gear, the spindle gear being axially slidably engaged with the driving gear while maintaining continuous mesh therewith, a segment gear having a hub rotatably borne by the plate in the chamber for oscillatory movement about an upstanding axis and having gear teeth in mesh with the pinion for imparting oscillatory movement thereto, linkage means interconnecting the drive shaft and the segment gear for imparting oscillatory movement to the segment gear incident to rotation of the drive shaft, and powered means borne by the plate and connected to the drive shaft for imparting rotation thereto.

13. The sprinkler of claim 16 wherein said linkage means is connected to the segment gear for adjustable movement radially inwardly and outwardly of the axis of oscillatory movement of the segment gear.

14. In an oscillatory fluid sprinkler, a housing providing a chamber having a fluid inlet, a fluid conducting spindle, means rotatably mounting the spindle in the housing in fluid communication with the chamber and for reciprocal axial movement, a drive shaft mounted in the housing eccentrically of the spindle, a driving wheel concentrically secured to the drive shaft for unitary rotation therewith, an elongated spindle driving gear rotatably mounted in the housing in axially offset relation to the spindle and to the shaft, a driven pinion coaxially secured to the driving gear, a spindle gear concentrically secured to the lower end of the spindle in mesh with the spindle driving gear, the spindle gear being axially slidable with respect to the driving gear, a segment gear having a hub rotatably mounted in the housing for oscillatory movement about an upstanding axis substantially diametrically related to the axis of the pinion on the opposite side of the spindle from said pinion and having gear teeth in mesh with the pinion for imparting oscillatory movement thereto, a crank having opposite ends pivotally connected to the segment gear and to the wheel in radially spaced relation to the output shaft for oscillating the segment gear incident to rotation of the shaft, and powered means mounted in the housing and connected to the drive shaft for imparting rotation thereto.

15. In a fluid sprinkler, an elongated housing having an upper end and a lower fluid inlet adapted for connection to a source of fluid under pressure, the housing providing an annular ledge transversely thereof between the upper and lower ends and a pair of longitudinally spaced radially inwardly extended annular shoulders defining a groove therebetween in longitudinally adjacent spaced relation to the ledge between the ledge and the upper end of the housing, the upper shoulder including a plurality of segments in spaced relation to each other and defining notches therebetween leading into the groove, a support plate rested on the ledge of the housing, a seal circumscribing the plate in circumferentially fluid-tight engagement with the plate and the housing to define a chamber therebelow communicating with the inlet to the housing, a locking ring disposed in the plane of the groove providing a plurality of tongues radially outwardly extended into the groove between the shoulders and slidable therein incident to rotation of the ring for registration with the notches, a plurality of screws longitudinally screw-threaded through the locking ring and engaging the plate for releasably adjustably pressing the plate against the ledge, and an elongated fluid conducting tubular member mounted in the plate having a lower inlet end communicating with the chamber and an upper fluid discharge end wherein the fluid conducting member is mounted for longitudinal slidable movement between a position retracted within the upper end of the housing and a fluid discharging position outwardly extended from the upper end of the housing, the fluid in the chamber serving to slide the fluid conducting member into said fluid discharging position incident to application of fluid pressure against the lower end of the fluid conducting member, and including means secured to the fluid conducting member for engagement with the support plate to limit longitudinal slidable movement of the conducting member toward said discharging position.

16. In a fluid sprinkler, an elongated housing having an upper end and a lower fluid inlet adapted for connection to a source of fluid under pressure, the housing providing an annular ledge transversely thereof between the upper and lower ends and a pair of longitudinally spaced radially inwardly extended annular shoulders defining a groove therebetween in longitudinally adjacent spaced relation to the ledge between the ledge and the upper end of the housing, the upper shoulder including a plurality of segments in spaced relation to each other and defining notches therebetween leading into the groove, a support plate rested on the ledge of the housing, a seal circumscribing the plate in circumferentially fluid-tight engagement with the plate and the housing to define a chamber therebelow communicating with the inlet to the housing, a locking ring disposed in the plane of the groove providing a plurality of tongues radially outwardly extended into the groove between the shoulders and slidable therein incident to rotation of the ring for registration with the notches, a plurality of screws longitudinally screw-threaded through the locking ring and engaging the plate for releasably adjustably pressing the plate against the ledge, and an elongated fluid conducting tubular member mounted in the plate having a lower inlet end communicating with the chamber and an upper fluid discharge end, wherein the fluid conducting member is a spindle rotatably mounted in the plate, wherein a spindle gear is rigidly connected to the lower end of the spindle within the chamber, wherein a spindle driving gear is rotatably supported on the plate within the chamber in axially offset relation to the fluid conducting member and in mesh with said spindle gear, and wherein means is mounted in the housing and has driving connections to the spindle drive gear for imparting movement thereto about the axis of the driving gear thereby to impart movement to the spindle about its axis.

17. In a fluid sprinkler, a tubular housing having an inlet end adapted for connection to a source of fluid under pressure and an outlet end, a support plate disposed transversely of the housing intermediate the ends thereof insertable and removable from the outlet end of the housing, means releasably mounting the plate in the housing with said plate and housing defining a chamber communicating with the inlet end of the housing, a fluid conducting tubular member having an inlet end communicating with the chamber and a discharge end disposed at the outlet end of the housing mounted in the plate for rotational and longitudinally slidable movement between a position with its discharge end retracted within the

outlet end of the housing and a fluid discharging position with the discharge end relatively outwardly spaced from its retracted position, the fluid in the chamber serving to slide the tubular member into said fluid discharging position incident to application of fluid pressure against the inlet end of the tubular member, fluid driven means borne by the plate within said chamber in fixed spaced relation to the plate and insertable and removable from the housing with the plate, and a telescopic drive linkage interconnecting the fluid driven means and the tubular member accommodating slidable movement of the tubular member between retracted and discharging positions while the plate and driven means are retained in fiixed position in the housing.

18. In a fluid sprinkler, an elongated tubular housing having an inlet end adapted for connection to a source of fluid under pressure and an outlet end, a support plate disposed transversely of the housing intermediate the ends thereof insertable and removable from the outlet end of the housing, the plate and the housing defining a chamber communicating with the inlet end of the housing, a seal interconnecting the plate and the housing in releasable substantially fluid tight relation, an elongated fluid conducting tubular member having an inlet end communicating with the chamber and a discharge end disposed at the outlet end of the housing mounted in the plate for longitudinally slidable movement therein between a position with the discharge end retracted within the outlet end of the housing and a fluid discharging position relatively outwardly from the retracted position, the fluid in the chamber serving to slide the tubular member into said fluid discharging position incident to application of fluid pressure against the inlet end of the tubular member, fluid driven means mounted on the plate within said chamber in fixed relation to the plate and insertable and removable from the housing with the plate, an elongated drive gear connected to the driven means and extended therefrom in substantially parallel relation to the tubular member, and a spindle gear mounted on the inlet end of the tubular member in driven engagement with the drive gear and for slidable movement longitudinally thereof accommodating slidable movement of the tubular member between retracted and discharging positions while the plate and driven means are retained in fixed position in the housing, said spindle gear being engageable with the support plate to limit longitudinally slidable movement of the tubular member in the direction of its discharging position.

19. In a fluid sprinkler, an elongated tubular housing having an inlet end adapted for connection to a source of fluid under pressure and an outlet end, a support plate disposed transversely of the housing intermediate the ends thereof insertable and removable from the outlet end of the housing, the plate and the housing defining a chamber communicating with the inlet end of the housing, a compressible fluid seal between the plate and the housing, means releasably interconnecting the plate and the housing, an elongated fluid conducting tubular member having an inlet end communicating with the chamber and a discharge end disposed at the outlet end of the housing mounted in the plate for longitudinally slidable movement therein between a position with the discharge end retracted within the outlet end of the housing and a fluid discharging position relatively outwardly thereof in the direction of the outlet end of the housing, the fluid in the chamber serving to slide the tubular member into said fluid discharging position incident to application of fluid pressure against the inlet end of the tubular member, fluid driven means mounted on the plate within said chamber in fixed relation to the plate and insertable and removable from the housing with the plate, an elongated drive gear connected to the driven means and extended therefrom in substantially parallel relation to the tubular member, and a spindle gear mounted on the inlet end of the tubular member in driven engagement with the drive gear and for slidable movement longitudinally thereof accommodating slidable movement of the tubular member between retracted and discharging positions while the plate and driven means are retained in fixed position in the housing, said spindle gear being engageable with the support plate to limit longitudinally slidable movement of the tubular member toward the outlet end of the housing.

20. In a fluid sprinkler, an elongated tubular housing having an inlet end adapted for connection to a source of fluid under pressure and an outlet end, the housing providing an annular ledge transversely thereof between the upper and lower ends and a pair of longitudinally spaced radially inwardly extended annular shoulders defining a groove therebetween in longitudinally adjacent spaced relation to the ledge between the ledge and the upper end of the housing, the upper shoulder including a plurality of segments in spaced relation to each other and defining notches therebetween leading into the groove, a support plate positioned on the ledge of the housing disposed transversely of the housing insertable and removable from the outlet end of the housing, the plate and the housing defining a chamber communicating with the inlet end of the housing, a seal interconnecting the plate and the housing in releasable substantially fluid tight relation, a locking ring disposed in the plane of the groove providing a plurality of tongues radially outwardly extended into the groove between the shoulders and slidable therein incident to rotation of the ring for registration with the notches, a plurality of screws longitudinally screw-threaded through the locking ring and engaging the plate for releasably adjustably pressing the plate against the ledge, an elongated fluid conducting tubular member having an inlet end communicating with the chamber and a discharge end disposed at the outlet end of the housing mounted in the plate for rotational and longitudinally slidable movement therein between a position with the discharge end retracted within the outlet end of the housing and a fluid discharging position with the discharge end outwardly extended from the outlet end of the housing, the fluid in the chamber serving to slide the tubular member into said fluid discharging position incident to application of fluid pressure against the inlet end of the tubular member, water motivated driving means mounted on the support plate in fixed space relation thereto within the chamber having driving connection to the tubular member whereby the tubular member is rotated relative to the plate, and means on the tubular member engageable with the support plate to limit longitudinally slidable movement of the tubular member toward the outlet end of the housing.

21. In a fluid sprinkler, an elongated tubular housing having an inlet end adapted for connection to a source of fluid under pressure and an outlet end, the housing providing an inwardly disposed ledge intermediate the inlet and outlet ends, a support plate positioned against the ledge of the housing, the plate and the housing defining a chamber communicating with the inlet end of the housing, a seal circumscribing the plate in substantially fluid tight engagement with the plate and the housing, means releasably connected to the housing releasably holding the plate against the ledge, an elongated fluid conducting tubular member having an inlet end communicating with the chamber and a discharge end disposed at the outlet end of the housing mounted in the plate for longitudinally slidable movement therein between a position with the discharge end retracted within the outlet end of the housing and a fluid discharging position with the discharge end outwardly extended from the outlet end of the housing, the fluid in the chamber serving to slide the tubular member into said fluid discharging position incident to application of fluid pressure against the inlet end of the tubular member, fluid driven means mounted on the plate within said chamber in fixed relation to the plate and insertable and remova-

ble from the housing with the plate, an elongated drive gear connected to the driven means and extended therefrom in substantially parallel relation to the tubular member, and a spindle gear mounted on the inlet end of the tubular member in driven engagement with the drive gear and for slidable movement longitudinally thereof accommodating slidable movement of the tubular member between retracted and discharging positions while the plate and driven means are retained in fixed position in the housing, said spindle gear being engageable with the support plate to limit longitudinally slidable movement of the tubular member toward the outlet end of the housing.

22. In a fluid sprinkler, an elongated housing having an upper end and a lower fluid inlet adapted for connection to a source of fluid under pressure, the housing providing an annular ledge transversely thereof between the upper and inlet ends of the housing, a support plate insertable and removable from the upper end of the housing rested on the ledge of the housing and with the housing defining a chamber therebelow communicating

with the inlet, a locking ring releasably mounted in predetermined position transversely of the housing above the support plate, a plurality of screws longitudinally screw-threaded through the locking ring and engaging the plate for releasably adjustably pressing the plate against the ledge, a fluid conducting tubular member having an inlet communicating with the chamber and a discharge end disposed at the outlet end of the housing mounted in the plate for rotational and longitudinally slidable movement between elevationally spaced discharge and retracted positions, fluid pressure in the chamber serving to slide the tubular member from retracted to discharge position, and fluid driven means borne by the plate within said chamber having driving connection with the tubular member and being insertable and removable from the housing with the plate.

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