June 2, 1970 R. B. COSTA 3,515,351

IMPACT MOTOR DRIVEN POP-UP SPRINKLER

Filed Sept. 11, 1968 2 Sheets-Sheet 1

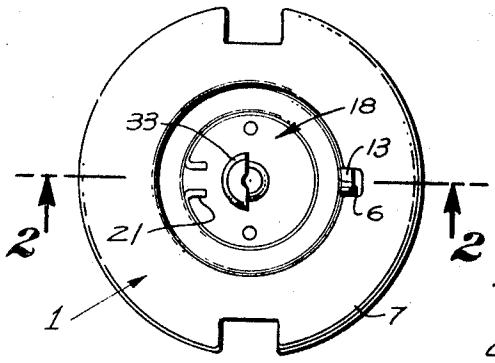


FIG. 1

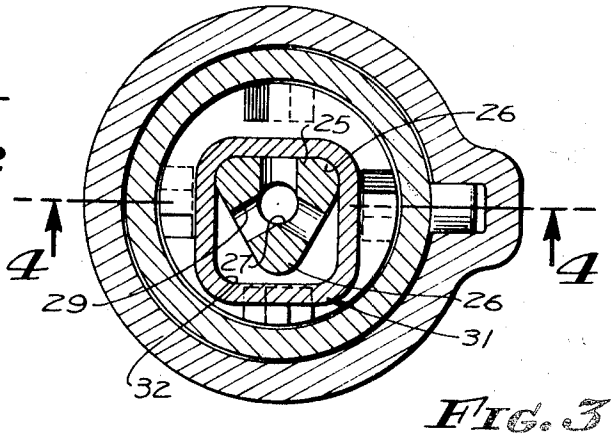


FIG. 3

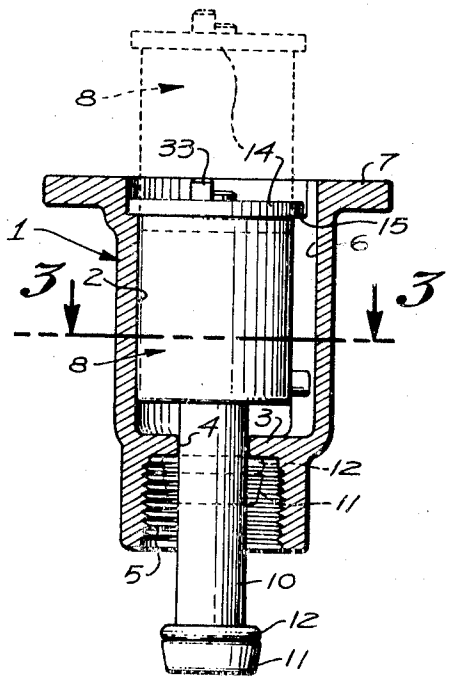


FIG. 2

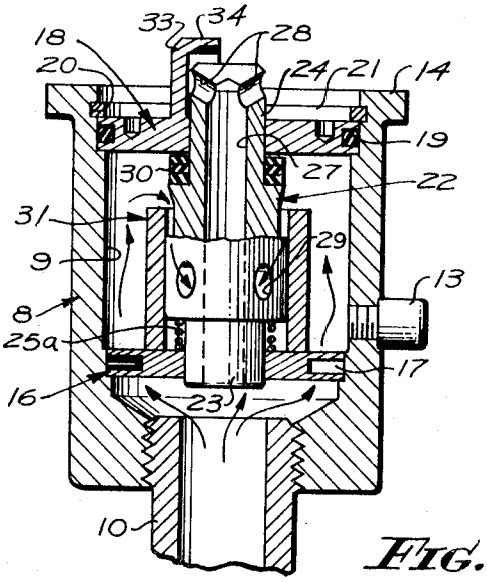


FIG. 4

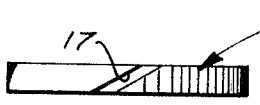


FIG. 5

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IMPACT MOTOR DRIVEN POP-UP SPRINKLER

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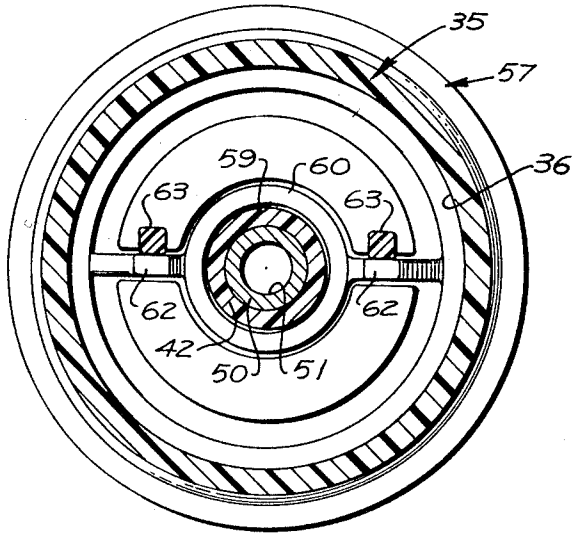


FIG. 7

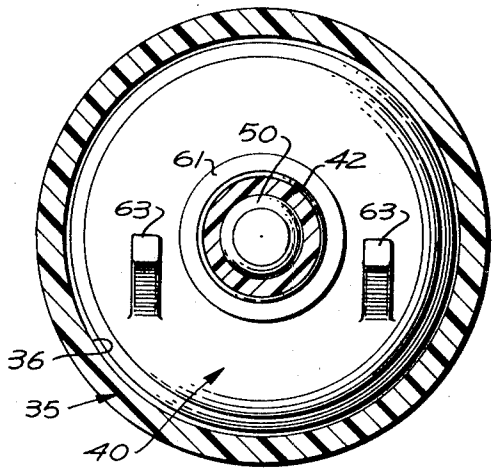


FIG 8

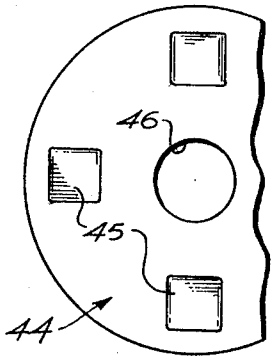


FIG. 9

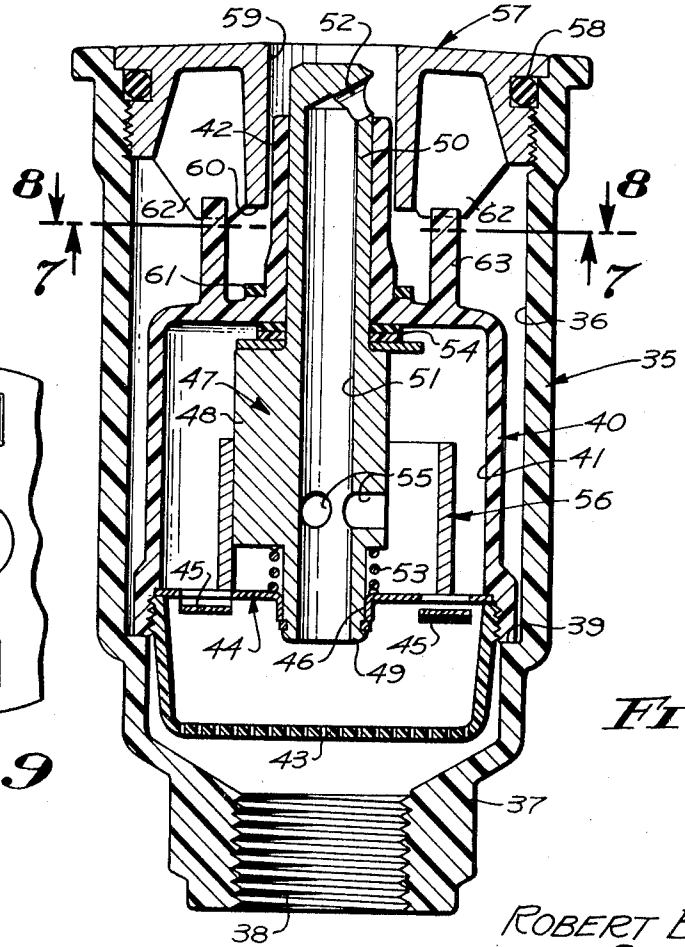


FIG. 6

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IMPACT MOTOR DRIVEN POP-UP SPRINKLER

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Int. Cl. B05b 3/00
U.S. Cl. 239—206 6 Claims

ABSTRACT OF THE DISCLOSURE

A pop-up sprinkler utilizing an impact type of drive encased in a motor case of fixed dimensions and capable of limited axial movement to raise the spray nozzle when in operation.

BACKGROUND AND SUMMARY OF THE INVENTION

The present invention is related to a rotating sprinkler utilizing the type of water motor disclosed in Pat. No. 3,315,898. In the construction there illustrated, the motor chamber is elongated in order to permit the spray nozzle to rise. This type of motor has proven to be a most feasible means for rotating sprinkler heads, but, as disclosed, is limited in its application.

The present invention has, inherently, a wider range of application, as indicated by the following objects:

First, to provide a pop-up type of rotating sprinkler utilizing an impact type of water motor in which the water motor is contained in a case of fixed dimension minimizing the required axial length of the rotor and the impact armature, the case being connected to the sprinkler head for axial movement as a unit therewith.

Second, to provide a sprinkler as indicated in the preceding object, wherein the sprinkler head and case may be constructed to travel axially a short distance or a substantial distance, or be fixed axially without change in the motor.

Third, to provide a sprinkler of the type indicated in the accompanying objects in which the motor case may be provided with a cover on which may be mounted a deflector so that the resulting spray from the sprinkler head may cover a preselected portion of a circle, such as a three-quarter, one-half or one-quarter circle, although the sprinkler head makes a full circle rotation; the cap being adjustable circumferentially to cause the spray to discharge in the desired direction.

Fourth, to provide a sprinkler of this type in which the axially movable sprinkler motor case, is contained in a housing having a cover provided with a small aperture through which a sprinkler stem connected to the rotor extends and retracts, to minimize interference by surrounding plants.

Fifth, to provide a sprinkler as indicated in the preceding object which incorporates a novel means including guides on the cover of the housing and on the motor case which automatically interengage as the cover is screwthreaded in place to restrain the motor case against rotation.

DESCRIPTION OF THE FIGURES

FIG. 1 is a plan view of the impact motor driven pop-up sprinkler.

FIG. 2 is a sectional view thereof, taken through 2—2 of FIG. 1, with the internal mechanism shown in elevation.

FIG. 3 is an enlarged transverse sectional view, taken through 3—3 of FIG. 2.

FIG. 4 is an enlarged fragmentary longitudinal sectional view, taken through 4—4 of FIG. 3, and showing the internal mechanism.

FIG. 5 is an edge view of the swirl plate.

FIG. 6 is an enlarged longitudinal sectional view showing a modified embodiment of the pop-up sprinkler.

FIGS. 7 and 8 are transverse sectional views taken through the same plane but in directions 7—7 and 8—8, respectively.

FIG. 9 is a fragmentary plan view of the swirl plate.

Reference is first directed to FIGS. 1 through 5. The sprinkler herein illustrated includes a housing **1**, which forms a cylindrical cavity **2**, having a bottom wall **3**, provided with a constricted opening **4**. Below the bottom wall, the housing is provided with an integral, internally screwthreaded extension **5**, for attachment to a riser pipe, not shown. One side wall of the cavity **2** is provided with a keyway **6**. The upper extremity of the housing is provided with an external flange **7**.

The cylindrical cavity **2** receives a cylindrical motor case **8**, having a cylindrical motor cavity **9** therein. Screwthreaded into the bottom of the motor case **8** is a stem **10**, which extends downwardly through the constricted opening **4**, and is provided with an enlarged lower end **11**, forming an upwardly facing shoulder on which rests a seal ring **12**.

Projecting from the side wall of the motor case **8** is a key pin **13** which is received in the keyway **6**. The upper end of the motor case is provided with an external flange **14** and the upper portion of the cylindrical cavity **2** is counter bored to form a shoulder **15** on which the flange rests when the motor case **8** is in its retracted position within the housing, as shown in FIG. 2.

Near its bottom end, the cylindrical motor cavity **9** receives a swirl plate **16** in the form of a disk having helically pitched slots **17** formed in its periphery so that when the swirl plate is pressed into the bottom portion of the motor cavity, helical passages are formed which extend through the swirl plate. The swirl plate clears the upper end of the stem **10** so that water may flow upwardly through the stem and through the slots **17**.

The upper end of the motor cavity **9** is provided with a slight counter bore forming a shoulder on which rests a cover plate **18**, having a peripheral groove which receives a seal ring **19**. Above the cover plate, the wall of the cavity **9** is provided with an annular groove **20**, which receives a split retainer ring **21** to hold the cover plate in place.

The motor case receives a rotor **22**, having a lower stem **23** and an upper stem **24**. The stems journal in coaxial bearing openings provided in the centers of the swirl plate **16** and the cover plate **18**. Within the motor cavity, the rotor is enlarged to form an impact armature **25**, preferably having three sides, joined by rounded apices **26** which form impact ribs.

The rotor is provided with a bore **27**, which extends upwardly from its lower end to a point near its upper end, and communicates with a pair of diametrically disposed and upwardly directed nozzle orifices **28**. The bore **27** is also intersected by ports **29** which extend inwardly from the sides of the impact armature **25**. Interposed between the impact armature **25** and the cover plate **18** is a thrust washer set **30** which may include a pair of rubber washers separated by a low friction washer such as a polytetrafluorethylene so as to provide a limited degree of friction. A spring **25***a* urges the armature upwardly.

The impact armature **25** is surrounded by an impact or drive ring **31** which is square in plan, having rounded corners **32**. The spacing between the corners **32** and the adjacent apices **26** are essentially equal.

The sprinkler may be adapted for use as a full circle or part-circle sprinkler. If a part-circle sprinkler is desired, the cover plate **18** is provided with a hollow, semi-cylindrical boss **33**, having an inturned flange **34**. The boss may

occupy a half-circle as shown of a quarter-circle or a three-quarter circle.

Operation of the sprinkler shown in FIGS. 1 through 5 is as follows:

When water pressure is applied, the motor case **8** and stem **10** are forced upwardly to the dotted line position shown in FIG. 2. Some water flows upwardly into the bore **27**; the rest of the water is diverted to the slots **17** and enter the motor cavity **9** in a circular path. The rotating water passing upwardly outside the drive ring **31** causes the drive ring to rotate and on rotating to strike the apices of the impact armature **25**. With each impact, the rotor is turned slightly with the result that the rotor turns slowly. The motivating water flows upwardly over the top of the drive ring and into the ports **29** for ultimate discharge through the nozzle orifices **28**.

If a full circle operation is desired, the boss **33** is omitted and the pin **13** may be omitted. If a part cricle operation is desired, the disk is provided with a boss **33** of appropriate arcuate extent. As the nozzle orifices rotate, water from the nozzle directed toward the boss is redeflected in the desired direction. The water on being redirected loses considerable velocity so that it falls near the sprinkler, whereas the unimpeded water is discharged a greater distance.

Reference is now directed to FIGS 6 through 9. The construction here illustrated includes a housing **35**, which forms a cylindrical cavity **36** and is provided with a bottom wall **37**, having an internally screwthreaded opening **38** for connection to a riser pipe. Within the cavity **36** near its lower end, there is provided a shoulder **39**.

The housing **35** receives a motor case **40** in the form of an inverted cup, forming a cylindrical motor cavity **41**. The upper or closed end of the motor case is provided with an upwardly directed sleeve **42**. The lower end of the motor case **40** is internally screwthreaded to receive the upper margins of a strainer cup **43**, having a plurality of perforations. Secured between the motor case **40** and the strainer cup **43**, is a swirl plate **44**, which may be in the form of a stamping having downwardly depressed swirl vanes **45** and a central journal aperture **46**.

The motor case receives a rotor **47**, having an impact armature **48** similar to the impact armature **25**. The rotor includes a lower stem **49**, and an upper stem **50**, and is provided with a central bore **51** which terminates near the upper end of the upper stem, and is provided with a laterally and upwardly directed sprinkler orifice **52**. The upper stem journals in the sleeve **42**. As in the first described structure, the impact armature is urged upwardly in the motor cavity by a spring **53**, and a set of washers **54** is interposed between the upper end of the impact armature and the upper wall of the motor cavity to provide a controlled minimal amount of friction. As in the first described structure, the impact armature is provided with radial ports **55**. Also, as in the first described structure, the impact armature is surrounded by an impact or drive ring **56**.

The upper end of the housing **35** is internally screwthreaded to receive a cover **57**, having a seal ring **58**. The cover is provided with a central bore **59**, which receives the sleeve **42** and the upper stem **50**. Surrounding the lower extremity of the bore **59** is a seat **60**, which when the motor case is in its upper position, is engaged by a seal washer **61** surrounding the sleeve **42** and its base end.

The cover **57** is provided with a pair of essentially radially directed guide webs **62** and the motor case **40** is provided with a pair of upwardly extending guide bosses **63**. When the cover is secured in place, the guide webs and guide bosses overlap axially. The guide bosses are on the same side of the webs so that they function to keep the motor case **40** from rotating relative to the cover. In order to secure the cover in place, one guide web and its corresponding boss overlap a greater extent than the other set so that as the cover **57** is screwthreaded into the housing **35**, one web and boss set interengage before the other so as to turn the motor case with the cover and permit the other web and boss set to move relatively into axially overlapping relation.

While particular embodiments of this invention have been shown and described, it is not intended to limit the same to the details of the constructions set forth, but instead, the invention embraces such changes, modifications and equivalents of the various parts and their relationships as come within the purview of the appended claims.

I claim:

1. A rotatable water sprinkler, comprising:

(a) a motor case having relatively fixed upper and lower axial ends defining therebetween a motor chamber, said axial ends having coaxial journal openings;

(b) a rotor having upper and lower stems journalled in said openings, and a polygonal impact armature within said motor chamber; said rotor having a bore extending from its lower end and terminating adjacent its upper end, a spray orifice at the upper end of said rotor communicating with said bore, and ports extending through said armature and communicating with said bore;

(c) a polygonal rotary drive ring surrounding said impact armature;

(d) means defining water passages through a wall of said motor chamber directed to cause rotary movement of water in said motor chamber thereby to cause rotary motion of said drive ring and multiple impacts of said ring on said armature to effect rotation of said rotor;

(e) and means for supplying water to the bore of said rotor and to said passages.

2. A sprinkler, as defined in claim **1**, wherein:

(a) said water supplying means includes a housing surrounding said motor case;

(b) key and keyway means for guiding said motor case and rotor axially as a unit within said housing thereby to permit said spray orifice to be raised and lowered a predetermined distance.

3. A sprinkler, as defined in claim **1**, wherein:

(a) said water passage defining means is a disk fixed in said motor case and includes helically directed passages adjacent the periphery thereof.

4. A sprinkler, as defined in claim **1**, wherein:

(a) the upper end of said motor case is a plate adjustable in orientation about the axis of said rotor;

(b) the upper stem of said rotor protrudes from said plate;

(c) and a deflector partially encases said stem to limit the arc through which said spray orifice discharges.

5. A sprinkler, as defined in claim **1**, wherein:

(a) said water supplying means includes a housing surrounding said motor case and an apertured cover for said housing;

(b) and said motor case includes a sleeve slidable in said cover aperture and journaling the upper stem of said rotor.

6. A sprinkler, as defined in claim **5**, wherein:

(a) said cover and said motor case are provided with axially overlapping guide means to restrain said motor case against rotation when said cover is fixed.

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