# **United States Patent**

| [72]  | Inventor  | Robert B. Costa               |
|-------|-----------|-------------------------------|
|       |           | Covina, Calif.                |
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| 1731  | Assignee  | Rain Bird Sprinkler Mfg. Corp |
| . • , | 9         | Glendora, Calif.              |

#### [54] BEARING FOR IMPACT MOTOR DRIVEN SPRINKLER 4 Claims, 4 Drawing Figs.

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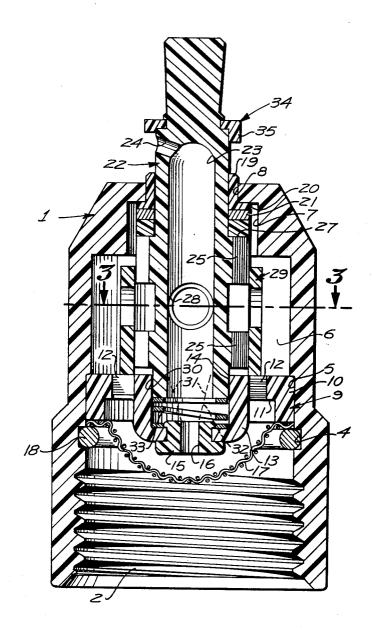
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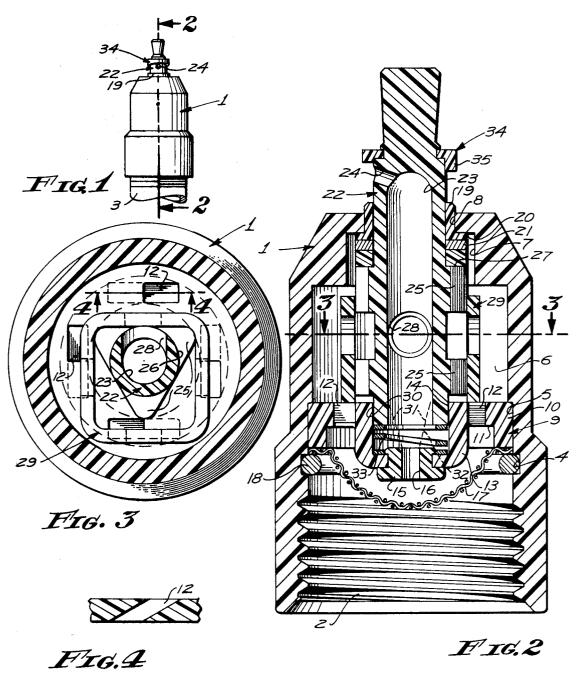
   230, 241, 260, 225, 210, 251, 261, 264

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| Primary Examiner—M. Henson Wood, Jr.<br>Assistant Examiner—Thomas C. Culp, Jr.<br>Attorney—Lyon & Lyon |        |                         |          |  |  |

**ABSTRACT:** A bearing at the water entrance end of an impact motor for rotating sprinkler formed by the lower end of a tubular rotor and the walls of a surrounding socket, the bottom end of the socket having an inlet port of smaller diameter than the bore through the rotor so that incoming water and particles therein are jetted into the bore in such a manner that water flow between the confronting surfaces of the bearing is minimized.







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## 1 BEARING FOR IMPACT MOTOR DRIVEN SPRINKLER

### BACKGROUND AND SUMMARY OF THE INVENTION

The present application has particular relation to the type of sprinkler motor disclosed in my U.S. Pat. No. 3,315,898 and copending application, Ser. No. 758,961, filed Sept. 11, 1968. Motors of this type are driven by water which is later discharged from the sprinkler nozzles. The water is seldom free of particulate matter containing a percentage of such size 10 as to enter between confronting surfaces of the motor bearings, particularly the lower bearing, so that unless such particles are filtered from the water, the motor must be periodically cleaned.

The bearing, which is the subject matter of the present in- 15 vention, minimizes this problem, and the invention is summarized in the following objects:

First, to provide a bearing particularly intended for the entrance end of sprinkler motors which is shielded from the direct flow of water intended to be discharged from the sprin- 20 kler, but which receives sufficient water to maintain lubrication.

Second, to provide a bearing adapted for the entrance end of an impact-type sprinkler motor wherein a tubular rotor and a surrounding socket form confronting bearing surfaces and 25 the socket is provided below and in alignment with the bore of the rotor with an inlet port smaller than the bore of the rotor so that the principal flow of water is axial through the central portion of the socket and only minimal flow occurs between the confronting bearing surfaces thereby minimizing the 30 probability of accumulation of particulate matter in the bearing.

#### DESCRIPTION OF THE FIGURES

FIG. 1 is a side view of a sprinkler incorporating the invention

FIG. 2 is an enlarged longitudinal sectional view thereof, taken through 2-2 of FIG. 1.

FIG. 3 is an enlarged transverse sectional view thereof, 40 taken through 3-3 of FIG. 2.

FIG. 4 is a fragmentary sectional view, taken through 4-4 of FIG. 3.

#### SPECIFICATION

A sprinkler incorporating the present invention includes a hollow body 1, having an internally screw-threaded lower end 2. adapted to be fitted at the upper end of a riser pipe 3, forming a part of an irrigation system. Immediately above the screw-threaded portion, the body is provided with an internal retainer ring groove 4. Spaced above the groove 4 is an internal stop shoulder 5. Above the shoulder there is provided a zone which defines a motor chamber 6. Internally, the upper end of the body is constricted to form a bearing chamber 7 and a guide opening 8.

Fitted between the shoulder 5 and the groove 4 is a swirl disc 9, which includes an outer rim 10, bearing against the shoulder 5. Immediately inward from the rim 10 there is formed an annular web 11 of reduced thickness in which is 60 formed several angularly directed swirl passages 12. That is, the passages 12 extend upwardly at an angle so that water entering the motor chamber above the swirl disc tends to move in a rotary pattern.

Inwardly from the web 11, the swirl disc forms a hub 13, 65 having a bearing socket 14 therein, the bottom end of which is provided with an opening which receives a water metering bushing 15, provided with an inlet port 16.

A filter screen 17 is positioned under the swirl disc 9, its received in the groove 4 and retains the filter screen as well as the swirl disc in position.

The guide opening 8 receives an upper sleeve bearing 19, having a flanged lower end 20 which forms a part of a multiple washer thrust bearing 21.

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Mounted between the bearing socket 14 and the sleeve bearing 19 is a rotor 22 which projects above the sleeve bearing. The rotor is provided with a central bore or flow passage 23 extending to a point above the upper sleeve bearing 19, and is provided with a laterally and upwardly directed discharge orifice 24. Within the motor chamber 6, the rotor is provided with an upper and lower set of impact bosses 25, separated by an annular channel 26. In the construction illustrated, sets of three impact bosses are provided, each set defining a triangle having rounded apices. The upper extremity of the upper set of impact bosses forms a shoulder 27 which bears against the thrust bearing 21. A side opening 28 is provided between the channel 26 and the bore or flow passage 23 of the rotor.

Within the motor chamber 6, there is mounted an impact ring 29, having in the construction illustrated, four sides with rounded corners which mate with the extremities of the impact bosses 25. Swirling water entering through the passages 12 cause the impact ring 29 to rotate, and in rotating to engage the impact bosses 25 to cause rotation of the rotor 22 at a relatively slow speed, all as more fully described in the aforementioned patent and application.

The present invention is directed primarily to the bearing construction which includes a journal 30 formed at the lower end of the rotor 22, and the bearing socket 14 which receives the journal. It will be noted that the confronting surfaces of the journal 30 and the bearing socket 14 are located radially outward from the inlet port 16 and the bore or flow passage 23. It will be noted that the inlet port 16 is constricted so that water flowing upwardly therethrough tends to jet into the lower end of the flow passage or at least to create a central zone 31 in which the water moves with sufficient velocity to carry entrained particulate matter well into the flow passage 23 for ultimate discharge through the orifice 24. Surrounding the central zone 31 is an annular zone 32 in which the water is 35 relatively quiescent or static; that is, while some water move-

ment occurs, its movement diminishes toward the walls forming a continuation of the bearing socket 14.

As a consequence, there is little or no water movement between the surfaces of the socket 14 and the lower journal 30. In any case, the water movement tends to be below that necessary to sustain the particulate matter in the water. It is clear from tests that the introduction of particulate matter into the space between the confronting journal surface 30 and 45 bearing socket surface 14 is minimized if not eliminated; whereas, in previous constructions, wherein these surfaces were exposed directly to water flow, the water motor required periodic cleaning.

A thrust spring 33 is interposed between the confronting 50 surfaces formed by the lower end of the rotor 22 and the margins of the bottom of the bearing socket 14. It is preferred that the spring be formed of flat wire not only to reduce the required axial length, but also to form a baffle which further decreases the possibility of water flow between the journal and the bearing surfaces. The thrust spring 33 provides a predetermined thrust load on the thrust bearing 21.

Tests have indicated a surprising further advantage obtained by minimizing water movement between the surfaces of the socket 14 and the lower journal 30. If any water movement does occur, it is not at high velocity; that is, any upward jet action of water is eliminated. It has been discovered that should any such jetting action occur, as would be the case if the entering side were exposed, turbulence and cavitation are produced in the water between the rotor 22 and the impact ring 29. Apparently such turbulence and cavitation interferes with the impact action of the ring 29 against the rotor 22; for, when this condition is eliminated, the turning force on the rotor is definitely improved.

Mounted on the upper end of the rotor, above the discharge margin underlying the outer rim 10. A split snap ring 18 is 70 orifice 24, is a jet distance selector 34 in the form of a ring with a depending rim 35 of varying depth. By circumferential adjustment of the ring, the rim is caused to deflect the jet to a greater or lesser extent and thus control the effective radius of discharge. This feature, however, is the subject of a separate 75 application.

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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 bearing structure for sprinkler motors including a disc at its entrance end and a rotor disposed perpendicular to said disc and having a water passing bore, said bearing structure 10 comprising:

a. a socket in said disc having a peripheral bearing surface;

b. a water inlet port centered in the bottom of said socket;

- c. a peripheral journal surface on said rotor dimensioned to mate with and rotate within said bearing surface with said 15 bore in coaxial relation to said inlet port; and
- d. said bore and said port being of smaller radial dimension than said water passing bore to confine water flow principally to the center of said water passing bore and create a relatively static annular zone of water adjacent the walls 20 of said socket thereby to minimize water flow between said bearing and journal surfaces.

2. A bearing structure, as defined in claim 1, wherein:

a. a thrust spring is disposed in said annular zone tending to reduce further water movement therein. 25

3. A bearing structure for sprinkler motors of the impacttype which include a housing defining a motor chamber, a slotted swirl plate at the lower end of the motor chamber, a rotor perpendicular to the swirl plate, and protruding from the housing, the rotor having a bore, impact surfaces, and an impact ring within said motor chamber and surrounding the impact surfaces of said rotor, said bearing structure comprising:

- a. a socket disposed in the center of said disc to receive the lower end of said rotor and defining a sleeve bearing engaging said lower end for rotation therein;
- b. an inlet port of smaller diameter than said rotor bore centered in said socket in axially spaced relation to said rotor and coaxial relation to said rotor bore and defining therewith a central zone for the flow of water into said bore; the end of said rotor and the confronting end of said socket surrounding said bore and inlet respectively defining an annular zone in which water tends to remain relatively static while water flows through said central zone thereby to protect said sleeve bearing from particulate matter carried in the water.
- 4. A bearing structure, as defined in claim 3, wherein:
- a. a coil spring is received in said outer zone and tends to reduce water motor motion therein.

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