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Leissner et al.

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[45] **Apr. 10, 1973**

[54] **DEFLECTOR SPOON FOR ROTARY SPRINKLERS**

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[73] Assignee: **Rain Bird Sprinkler Mfg. Corp.,** Glendora, Calif.

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[52] **U.S. Cl.** **239/233**

[51] **Int. Cl.** **B05b 3/02**

[58] **Field of Search** 239/231, 232, 233

[56] **References Cited**

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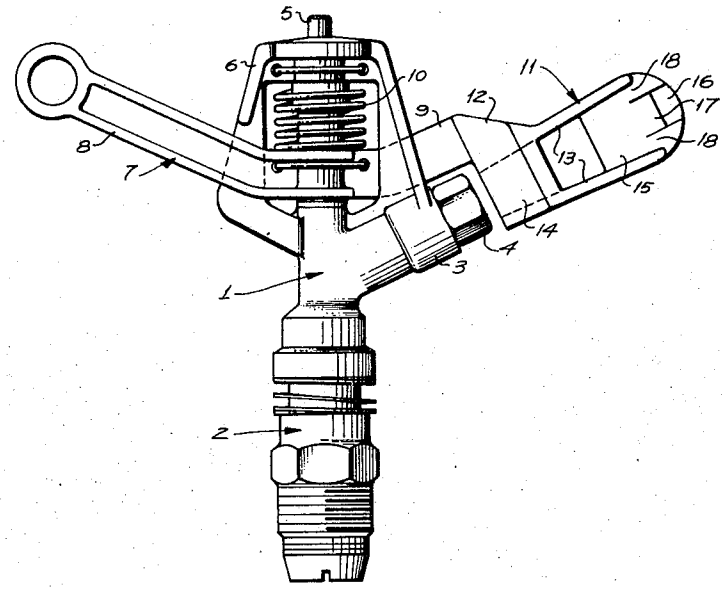
[57] **ABSTRACT**

A deflector spoon fitted on an end of an oscillating arm carried by a rotary sprinkler, the arm causing the spoon to move repeatedly into the water stream so as to impart a turning movement to the sprinkler; the spoon being so arranged that nozzles of a wide range of sizes may be interchanged without materially affecting the operation of the deflector spoon.

3 Claims, 5 Drawing Figures



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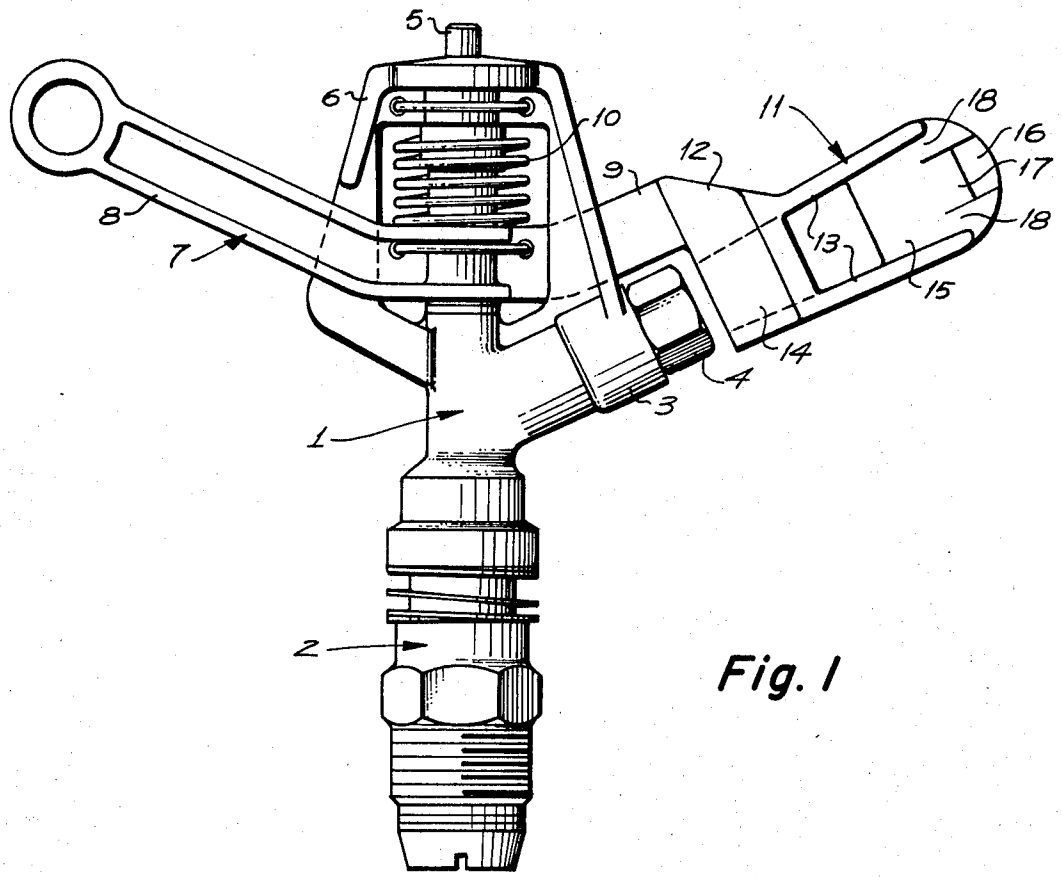

Fig. 1

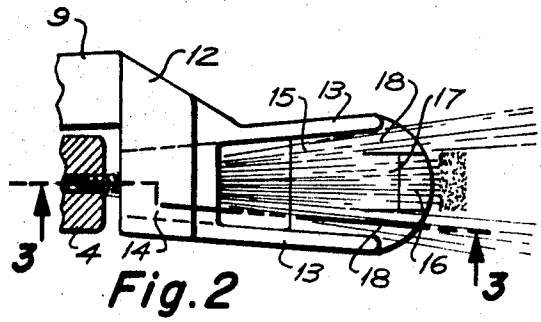

Fig. 2

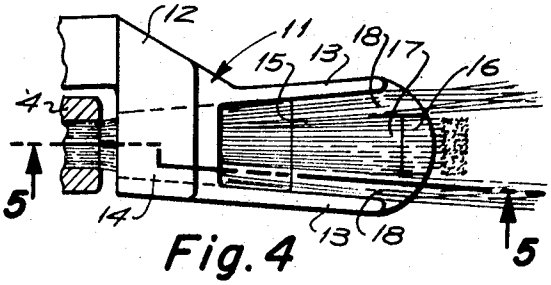

Fig. 4

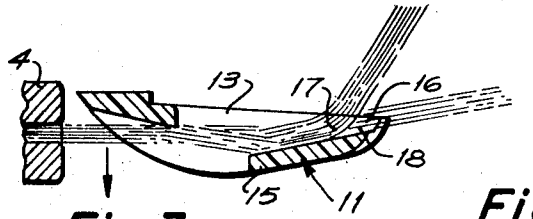

Fig. 3

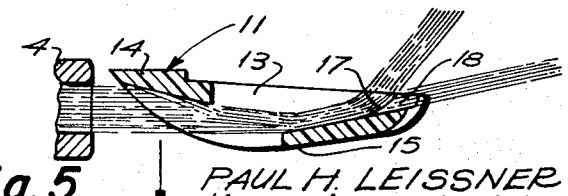

Fig. 5

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DEFLECTOR SPOON FOR ROTARY SPRINKLERS

BACKGROUND OF THE INVENTION

It is believed that the first successful rotary sprinkler was the sprinkler invented by ENGLEHART in 1935 U.S. Pat. No. 1,997,901. This was a full circle sprinkler. In 1945 he patented a part circle sprinkler, U.S. Pat. No. 2,380,101. Both inventions used an oscillating arm which carried a deflector or "spoon" at one end. The spoon was caused to move repeatedly into and out of the water stream to effect rotation of the sprinkler. Today the Englehart type sprinkler whether full circle or part circle, is probably the most widely used of the rotary sprinklers. The spoon construction has remained essentially the same as that used by Englehart, as exemplified by U.S. Pat. Nos. 2,792,256 and 3,468,485.

This type of sprinkler has been highly successful; however, the deflector spoon as well as its oscillating arm and return spring needs to be tailored or dimensioned for reaction with a particular nozzle size or limited range of nozzle sizes as well as operating pressures; otherwise, the oscillating arm swings excessively or not enough.

SUMMARY OF THE INVENTION

The present invention is directed to a rotary sprinkler having a deflector spoon in which the deflector spoon has a restricted water deflecting surface dimensioned for engagement by a decreasing proportion of the water as the volume of the discharge from the nozzle increases, so that the resultant force causing rotation of the sprinkler tends to remain constant or to undergo inconsequential change in the oscillation of the spoon supporting arm. As a result excessive swinging or oscillation of the arm is avoided thus permitting the use of a wide range of nozzle sizes while the remaining parts of the sprinkler remain unchanged.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side view of a rotary sprinkler incorporating the deflector spoon.

FIG. **2** is a side view of the deflector spoon taken from the same plane as FIG. **1** showing the adjacent nozzle tip fragmentarily and in section to indicate a base of small size and also showing the typical water flow pattern.

FIG. **3** is a bottom sectional view taken through **3—3** of FIG. **2** and showing the water flow pattern.

FIG. **4** is a side view corresponding to FIG. **2** showing a nozzle tip with a bore of large size and also showing the water flow pattern.

FIG. **5** is a bottom sectional view taken through **5—5** of FIG. **4** and showing the water flow pattern.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A typical sprinkler which utilizes a deflector spoon includes a sprinkler body **1** mounted for rotation within a journal assembly **2** which in turn is secured to a vertical riser not shown. The sprinkler body includes an upwardly and laterally directed nozzle arm **3** the extremety of which is internally screwthreaded to receive a nozzle tip **4**.

Extending upwardly from the sprinkler body is a journal pin **5** surrounded by a frame **6** forming an integral part of the sprinkler body. The journal pin receives an oscillating lever **7** having a counterbalancing arm **8** and a deflector spoon arm **9** in diametrically disposed relation.

The oscillating lever **7** is urged in one direction by a spring **10** and is urged in the opposite direction by the interaction of the water striking a deflector spoon carried by the oscillating lever.

Virtually since the inception of a rotary sprinkler utilizing an oscillating arm and deflector spoon little change has been made in the shape and form of a deflector spoon. Although the manner in which the oscillating arm transmits an impact to the sprinkler has varied and reversing mechanisms have been introduced. That is, since the inception of this type of rotary sprinkler the deflector spoon has received virtually all of the water issuing from the nozzle. As a result the size of the nozzle bore, the mass of the oscillating arm, the force of the return spring and under the pressure of which the sprinkler operates are all inter-related. In order to counteract the effect of water pressure a smaller nozzle bore is used for conditions of higher water pressure. If for a given set of conditions it is desirable to increase water flow by use of a larger nozzle, the range of increase has heretofore been extremely limited for the oscillating arm will swing too far and interfere with proper progressive movement of the sprinkler body.

In place of the conventional deflector spoon, a special deflector spoon **11** is formed integral with the oscillating lever **7** or is attached thereto. The deflector spoon includes an offset bracket portion **12** joined to the deflector spoon arm **9**. Extending in a direction essentially radial with respect to the axis of the sprinkler body are radially outwardly diverging upper and lower side walls **13**. Connecting the radially inner portions of the side walls **13** is an initial deflector web **14**. Extending between the side walls **13** and arcuatively as well as radially offset from the web **14** is an opposed deflector web **15**.

The deflector spoon thus far described is similar to the conventional deflector spoon. However, the opposed deflector web **15** of the conventional spoon terminates in a curved deflector ridge which completely fills this space between the side walls **13** so that all of the water issuing from the nozzle is deflected thereby when the spoon is in the water discharge path from the nozzle.

In the exercise of the present invention, the central portion of the deflector web **15** is provided with a relatively narrow main deflector element **16** having a curved deflector face **17**. The deflector element **16** is bordered by side slots **18** bounded on their remote side by the radially outer portions of the walls **13**. The surfaces of the two side slots are flush with the normal surface of the deflector web **15**.

The deflector spoon is urged into the water stream issuing from the nozzle tip by the spring **10**. In the construction illustrated, the spoon moves and is moved by the water in a counterclockwise direction as viewed from the top of the sprinkler but in a clockwise direction as viewed from the underside of the sprinkler, that is as viewed in FIGS. **3** and **5**. The water stream of jet first engages the initial deflector web **14** which draws the deflector spoon into the water stream, that is,

it urges it in the same direction as the spring, however, the water is almost instantaneously deflected to the opposed deflector web **15**. In doing so, a portion of the water is further deflected by the main deflector element **16**. This deflection is in a direction to cause a reaction on the spoon which drives the spoon out of the water stream causing the oscillating arm **7** to swing in opposition to the spring. Energy is stored in the spring which drives the oscillating lever to return the deflector spoon into the water stream. Sufficient energy is stored in the oscillating lever as to cause it to strike the frame **6** turning the sprinkler body a slight amount before the water reaction on the main deflector element **16** again drives the deflector spoon and oscillating lever out of the water stream.

The same reaction occurs with the conventional deflector spoon and oscillating lever. However, as pointed out previously, the entire force of the water acts on the conventional deflector spoon whereas in the case of the present invention, only a portion of the water acts on the deflector element. As indicated by comparison of FIGS. **2** and **3** with FIGS. **4** and **5**, FIGS. **2** and **3** show the spray pattern from a nozzle tip of smaller bore and FIGS. **4** and **5** show the spray pattern when the nozzle bore is increased in diameter.

What seems to occur is that the water jet is flattened by the initial deflector web **14** to form a spray of rectangular cross-section between the side walls **13**, however, with a small bore only a small percentage of water is deflected through these side slots **18**, whereas with a larger bore it seems that a larger percentage of water is diverted to the side slots **18** with a result that the volume of water actually reacting with the main deflector element **16** remains constant through a range of nozzle bore diameters. To some extent this is true when the variable is water pressure and the nozzle bore is constant.

It also seems that the opposing reaction of the deflector webs **14** and **15** tend to cancel out so that the actual force which effects oscillation of the lever **7** is confined mainly to that part of the water striking the deflector elements **16**.

More particularly, in order to demonstrate the effect of the novelly constructed diverter spoon tests were made on two types of standard sprinklers manufactured by Rain Bird Sprinkler Mfg. Corp., one was a sprinkler made of brass designated No. 30W, the other designated 14600 was made principally of plastic parts. Both sprinklers including the deflector spoon were constructed essentially as illustrated in FIg. **1** except that the main deflecting element **16** was continuous between the side walls **13**. These are referred to in the following charts as "Std. Unslotted." A second pair of spoons, one formed of brass, the other of plastic material was provided with the slots **18** at either side of the main deflecting element **16**. These are referred to in the following charts as "slotted."

Considering the brass sprinkler No. 30W, the sprinkler was operated at a water pressure of 55 Psi. A set of nozzle tips having bores as indicated in the following Chart A were used as a measure of the deflecting force, the angular excursion of the oscillating lever **7** was measured in degrees.

Chart A:

No. 30W Sprinkler	Std. Unslotted	Slotted
9/32	134°	85°
1/4	130°	85°
7/32	120°	85°
9/64	50°	40°

Considering the plastic sprinkler 14600, this sprinkler was operated at a water pressure of 80 psi, but otherwise under the same conditions as sprinkler No. 30W, as indicated in Chart B.

Chart B:

14600 Sprinkler	Std. Unslotted	Slotted
9/32	115°	45°
1/4	115°	45°
7/32	90°	45°
9/64	45°	30°

It will be seen from Charts A and B that, except for the smallest nozzle, the swing of the oscillating arm was constant when a deflector spoon involving the present invention was used, whereas, the swing of the oscillating arm increased with increased nozzle bore.

While a particular embodiment of this invention has been shown and described, it is not intended to limit the same to the details of the construction 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 deflector spoon for rotary sprinklers, having a nozzle branch adapted to receive selectively a set of nozzle tips having a preselected range of bore diameters, and an oscillating arm, said deflector spoon comprising:

a. a main deflector element;

b. means supporting the deflector element on the oscillating arm for repeated movement therewith into and out of a water stream issuing from the nozzle tip;

c. the main deflector element having directing means for directing water from said nozzle along a path of predetermined width, and a deflector surface portion in said path, of fixed width less than that of said path and an effective water deflecting area less than the area of the stream issuing from any selected nozzle tip of the set whereby the quantity of water impinging on said deflector surface is substantially constant irrespective of the bore size of the selected nozzle tip, and the deflecting force reacting from said deflector surface tends to remain constant.

2. A deflector spoon for rotary sprinklers as defined in claim **1**, wherein:

a. an initial deflector web carried by the supporting means is interposed between the nozzle tip and the main deflector element for flattening the stream of water and directing the water stream into said path.

3. A deflector spoon for rotary sprinklers as defined in claim **2**, wherein:

a. said directing means includes a pair of diverging side walls bordering opposite sides of the main deflector element.

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