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NOZZLES OR JETS FOR ROTARY SPRINKLERS

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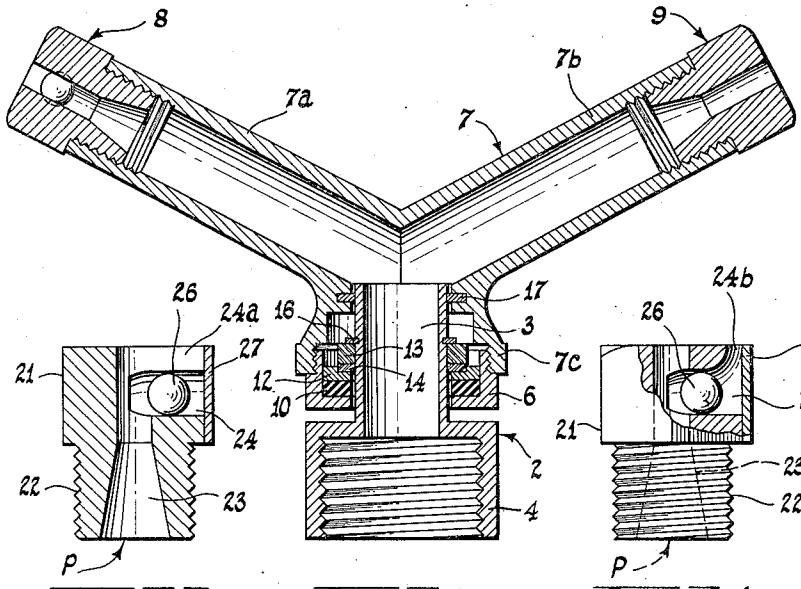


FIG. 2. FIG. 1.

FIG. 4.

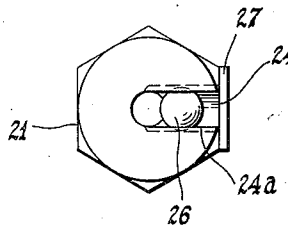


FIG. 3.

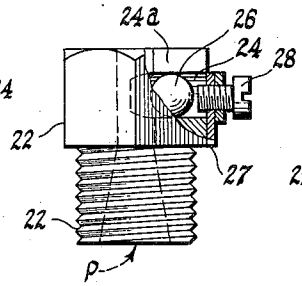


FIG. 6.

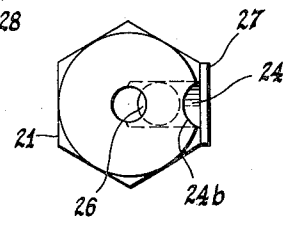


FIG. 5.

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NOZZLES OR JETS FOR ROTARY SPRINKLERS

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This invention relates to improvements in nozzles or jets for rotary sprinklers of the kind wherein the sprinkler arms are rotated due to reactionary forces arising from the issue of water from the nozzles.

The general object of the invention is to provide improved nozzles or jets which are of simple construction, and due to the small number of moving parts are long lasting and reliable. A further object is that of enabling the rotational speed of the spray arms to be infinitely varied between zero and a maximum by a simple adjustment to the nozzles or jets thereon.

Yet another object is to provide the above mentioned features in the improved nozzles or jets while still retaining an excellent distribution of the outlet water. These and other features will become more readily apparent as the description proceeds further.

More especially the invention provides for a ball element to be associated with the outlet passage of a nozzle for reciprocal movement into and out of the water stream in the outlet passage during operation of the sprinkler, so as to enhance dispersion of the water, create reactional driving force of a pulsating nature which ensures effective rotation of the sprinkler arm or arms and sets up vibrations tending to keep the interior of the nozzle free from grit and other foreign matter.

The invention will now be fully described and explained with reference to the drawings in which:

FIGURE 1 is a sectional elevation of a sprinkler head assembly according to the invention;

FIGURE 2 is a sectional elevation of a nozzle as seen in FIGURE 1;

FIGURE 3 is a plan of the nozzle seen in FIGURE 2;

FIGURE 4 is a part sectional elevation of a modified driving nozzle;

FIGURE 5 is a plan of the nozzle seen in FIGURE 4;

FIGURE 6 is a part sectional elevation of a driving nozzle similar to that in FIGURES 2 and 3 but incorporating an adjusting device.

Referring to the drawings, FIGURE 1 illustrates a rotary sprinkler head construction suitable for use with the nozzles or jets which form the subject of this invention. This sprinkler head consists firstly of a stationary member **2**, having a tubular upper portion **3** and preferably terminating at its lower end in an enlarged internally threaded nut portion **4**, for ready engagement with a water supply pipe.

The rotary mounting of the sprinkler head assembly comprises firstly a member **6** of tubular form having an inturned flange at its lower end. The upper end of member **6** has a threaded connection for attachment to the lower portion *7c* of the composite, somewhat Y shaped, tubular member **7**, the outer extremities of the arms *7a* and *7b* of this member forming the attachment points for the nozzles **8** and **9**.

Within the recess defined by the lower portion *7c* of member **7**, the inner surface of member **6**, and the outer surface of the tubular portion **3** of stationary member, is located the bearing and seal assembly for the sprinkler head.

This assembly consists primarily of upper and lower thrust bearing rings **13** and **14** respectively, both preferably composed of an organic material such as nylon, the upper thrust bearing **13** being a relatively tight fit on the upper portion **3** of the stationary member **2** and retained from upward movement thereon by a circlip **16**. The lower thrust bearing **14** is preferably accommodated within a groove in a washer-like metal member **12** which rests on a further washer-like member **10** composed of rubber or similar resilient material which in turn is supported by the inturned flange on the member **6**.

In addition to the foregoing, a sealing element **17** composed of felt or other usual sealing material is incorporated above the bearing assembly, between the rotary element **7**, and the stationary element **2**, in order to prevent as far as possible the entry of grit or other foreign matter into the bearing assembly.

The sprinkler head assembly in FIGURE 1 is shown fitted on one arm with a conventional plain nozzle **9** and on the other a driving nozzle **8** constructed in accordance with the invention. This arrangement may of course be varied when necessary to suit particular applications, for example, driving nozzles or jets could be used on both arms of the sprinkler head, or alternatively the sprinkler head could incorporate three or more arms with corresponding variations in the combination of nozzles used.

Referring now to FIGURES 1 to 6 the improved nozzle **8** consists firstly of a body piece **21**, preferably cylindrical, and having at one end a suitable means of attachment to a sprinkler arm, for example, a reduced externally screw threaded portion **22** adapted to engage in a similar but internally screw threaded end of the tubular sprinkler arm. The said body piece has a hole therethrough, preferably axial which may be termed the primary passage P.

The diameter of the primary passage at the end of the body piece which is attached to the sprinkler arm, is preferably larger than the diameter at the outer end, with the said two diameters connected by a tapered or somewhat venturi formation **23**. From the small diameter portion of the primary passage there extends, substantially at or near a right angle thereto, another passage which may be termed the secondary passage **24**. The secondary passage may be diverted at the outlet end to direct the water issuing therefrom in the direction of the main jet emerging from the primary passage.

Contained within the secondary passage **24** is a spherical ball **26** of smaller diameter than the secondary passage, but preferably of larger diameter than the primary passage P. This ball is free to oscillate along the secondary passage into and out of the water stream flowing through the primary passage.

With the nozzle in operation, the high velocity stream of water flowing through the primary passage creates a low pressure area at the mouth of the secondary passage. The suction due to this low pressure area draws the ball partially out of the secondary passage to project into the water stream in the primary passage. When this takes place, the pressure of the water in the primary passage again forces the ball back along the secondary passage whereupon the process is repeated.

The resulting oscillation of the ball in and out of the water stream in the primary passage causes the jet of water emerging from the nozzle to both deviate from the direction of the axis of the primary passage and to have a fluctuating velocity. These characteristics result in the features of this construction as regards, pulsating reactional driving force, water distribution, and ease of adjusting the rotational speed of sprinkler arms. As regards the latter feature it can be readily appreciated that since the oscillating ball causes the jet of water emerging from the nozzle to be diverted through an angle from the axis of the primary passage and hence from the axis of the sprinkler arm, all that is necessary to vary the horizontal angular deviation of the water jet from the axis of

the sprinkler arm is to rotate the nozzle about the axis of the sprinkler arm. When this is done, the horizontal component of velocity of the water jet and consequently the reactional driving force causing rotation of the sprinkler arm, is varied, which results in a change in rotational speed of the said sprinkler arm.

The maximum rotational speed is obtained when the nozzle is turned so that the water jet has a maximum horizontal angular deviation from the axis of the sprinkler arm. By turning the nozzle through ninety degrees in either direction from this position the horizontal angular deviation from the axis of the sprinkler arm and hence the speed of rotation of the said sprinkler arm, will be zero. Rotating the nozzle through a further ninety degrees in the same direction as the first will result in the sprinkler arm again having maximum rotational speed, but in the reverse direction.

The secondary passage of FIGURES 2 and 3 is shown open at its top by means of a vertical slot **24***a* and is closed at its outer end by a plate or like closure **27**.

According to FIGURES 4 and 5, the secondary passage is only partly closed at its top, a gap **24***b* leading upwardly from the outer end of the passage.

In order to vary the stroke or permissible movement of the reciprocal ball **26** in the secondary chamber, an adjusting screw **28** may be provided, and as will be apparent the action and effect of the reciprocating ball may be infinitely adjusted.

Any suitable material may be used in the manufacture of these nozzles and their component parts, for example, metal or organic materials such as nylon, and due to the simplicity of construction and the few moving parts involved, these nozzles are reliable and long lasting.

I claim:

1. An improved outlet nozzle for attachment near the outer end of a sprinkler arm associated with a rotary sprinkler rotatable about an axis of rotation, the issuance of water from said outlet nozzle providing the force necessary to revolve said arm about the axis of rotation, said outlet nozzle comprising a body portion having a primary outlet passage extending substantially axially therethrough and serving to direct the main outlet water stream, a secondary outlet passage extending substantially at right angles to said primary passage and communicating at one end with the primary passage, said secondary passage having a ball element therein freely reciprocable therealong under the action of the water stream in the primary passage so as to periodically enter, at least partially, the primary passage and the issuing water stream and thereby enhance dispersion of the water, create reactional driving force of a pulsating nature which ensures effective rotation of the sprinkler arm and set up vibrations tending to keep the interior of the nozzle free from grit and other foreign matter.

2. An improved outlet nozzle as claimed in claim 1 and wherein said secondary passage and said ball element are of larger diameter than said primary passage at its junction with said secondary passage.

3. An improved outlet nozzle as claimed in claim 1 and wherein said body portion has a side face and an outer end face, the primary passage having its outlet at said end face and the secondary passage terminating at said side face, and a plate positioned over the opening in said side face closing off the outer end of said secondary passage, said body portion having a slot therein of width less than the diameter of the secondary passage extending from said secondary passage to said end face in the direction of the primary passage, and from said primary passage to said side face in the direction of the secondary passage.

4. An improved outlet nozzle as claimed in claim 1 and wherein said body portion has a side face and an outer end face, the primary passage having its outlet at said end face and the secondary passage extending to said side face, a plate over and closing the opening in said side face, an opening being formed adjacent said plate and extending from the secondary passage to said outer end face.

5. An improved outlet nozzle as claimed in claim 1 and means for varying the permissible reciprocal movement of the ball along the secondary passage.

6. An improved nozzle as claimed in claim 3 and means to vary the permissible reciprocal movement of the ball along the secondary passage, said means comprising a screw which extends through the plate over the outer end of said secondary passage.

7. An improved nozzle as claimed in claim 1 and wherein the outer end portion of said primary passage is cylindrical in shape and of uniform diameter and the inner end portion is of somewhat venturi or conical form, progressively increasing in diameter from its junction with said outer end portion.

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