Sept. 28, 1965 F. H. P. SULLY 3,208,672

REACTION-JET-CONTROLLING ATTACHMENT FOR WATER SPRINKLERS

Filed March 23, 1965

Fig. 1.

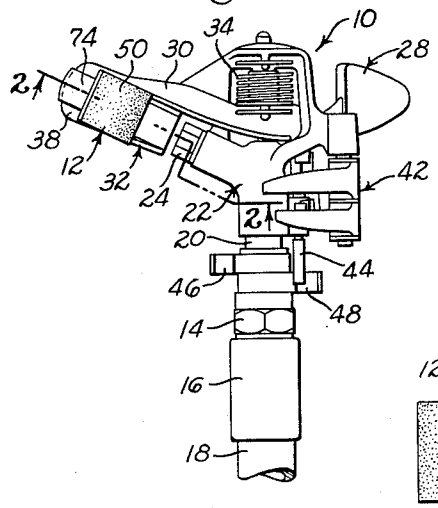


Fig. 6.

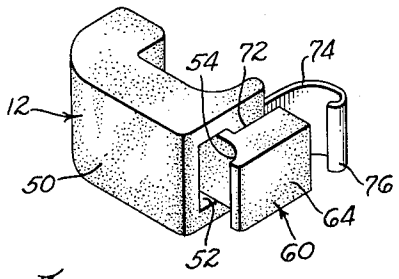


Fig. 4.

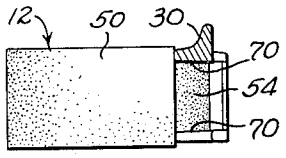


Fig. 5.

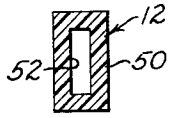


Fig. 2.

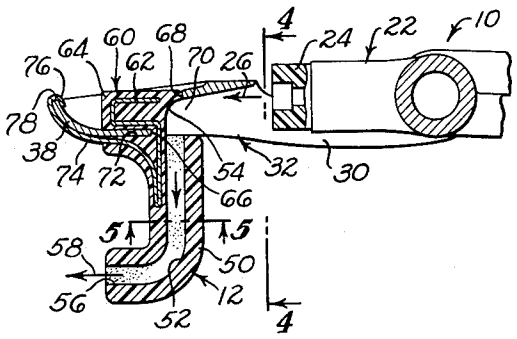


Fig. 3.

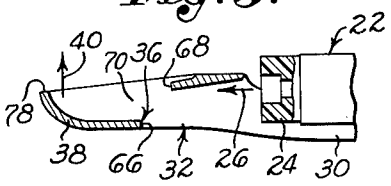


Fig. 8.

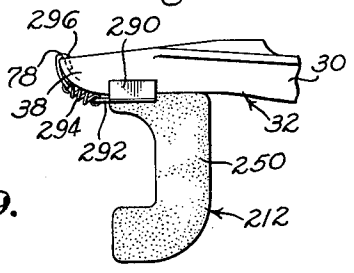


Fig. 7.

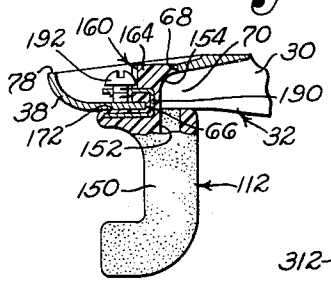
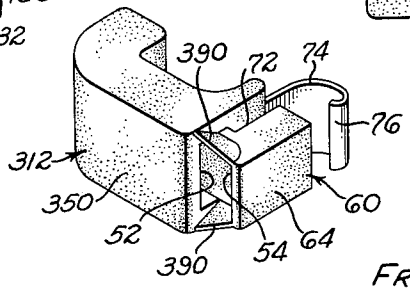


Fig. 9.



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REACTION-JET-CONTROLLING ATTACHMENT FOR WATER SPRINKLERS

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4 Claims. (Cl. 239—230)

The present invention relates in general to a water sprinkler of the type which includes an angularly movable discharge structure having a nozzle for producing a main jet, and which includes oscillatory reaction means operable by the main jet, and normally producing a laterally-directed reaction jet, for displacing the discharge structure angularly in a step-by-step manner. More particularly, the invention relates to reaction-jet-controlling means for directing the normally-lateral reaction jet of such a sprinkler along a path generally parallel to the path of the main jet.

Orienting the reaction jet in generally the same direction as the main jet in the foregoing manner is advantageous in both partial circle and full circle sprinklers of the type under consideration. In a partial circle sprinkler of this character, the discharge structure is caused to move alternately in opposite directions through an angle of less than 360°, thereby causing the main jet to sweep a corresponding sector. Frequently, such a sector swept by the main jet is bordered by objects or areas from which water should be excluded, such as buildings, sidewalks, plantings requiring lesser amounts of water or different watering techniques, and the like. In such an environment, the reaction-jet-controlling means of the invention confines the reaction jet produced by the sprinkler to essentially the same sector as the main jet, thereby avoiding watering of objects or areas from which water is desirably excluded. In a full circle sprinkler of the type under consideration, the discharge structure rotates continuously in one direction, instead of being pivoted back and forth through a sector of less than 360°. In such an environment, even though reaction-jet control is not necessary to protect adjacent objects or areas, the present invention is nevertheless advantageous because, by directing the reaction jet along a path generally parallel to that of the main jet, better water distribution over the circle being sprinkled is achieved.

As background, the oscillatory reaction means of a water sprinkler of the type in question comprises a spring-biased, oscillatory driving lever or driver having a spoon movable into and out of the path of the main jet. The latter deflects the spoon against the biasing action of the spring, with the result that the driver oscillates back and forth relative to the discharge structure to advance the discharge structure angularly in a step-by-step manner. However, the spoon of the oscillatory driver, in a conventional sprinkler of this type, produces a laterally-directed reaction jet or spray which is undesirable, in either a partial circle or a full circle sprinkler, for the reasons hereinbefore indicated.

Patent No. 3,022,012, granted February 20, 1962 to Carl R, Sharp and John E. Streeter, discloses a reaction-jet-controlling means, for directing the reaction jet along generally the same line as the main jet, which comprises a reaction member substituted for the conventional spoon of the oscillatory driver and forming an integral part of the driver. While the reaction-jet-controlling means of the Sharp et al. patent performs the desired function, it is limited to use in new sprinklers, or, at best, to modifying existing sprinklers by substituting complete new oscillatory drivers.

The primary object of the present invention is to provide a reaction-jet-controlling attachment, for producing a reaction jet directed along a path generally parallel to the path of the main jet, which can be mounted on the spoon of an existing sprinkler quickly and easily and without any modification of the sprinkler.

More particularly, an important object of the invention is to provide mounting means on the reaction member which is insertable into the opening in the spoon through which the main jet passes whenever the spoon is in a position to intercept the main jet. A related object is to provide means for securing the reaction member to the spoon with the mounting means on the reaction member inserted into the opening in the spoon.

A more specific object of the invention is to provide a reaction-jet-controlling attachment comprising: a reaction member having a generally S-shaped passage therethrough provided with inlet and outlet ends; means on the reaction member and insertable into the opening in the spoon for mounting the reaction member on the spoon with the inlet end of the passage in a position to intercept the path of the main jet, upon movement of the spoon into the path of the main jet, and with the outlet end of the passage facing generally in the direction of the path of the main jet, so as to direct a reaction jet produced by the reaction member along a path generally parallel to the path of the main jet; and means securing the reaction member to the spoon.

A further object of the invention is to make the mounting means on the reaction member of an elastomeric material so that it can be inserted into spoon openings of varying sizes and shapes, whereby one attachment will fit various sprinklers of the character under consideration. A related object is to provide the mounting means with thin elastomeric webs which fit snugly against the sides of the spoon to seal the mounting means in the spoon opening.

Another object is to provide a reaction-jet-controlling attachment which is made entirely of an elastomeric material, with suitable metallic reinforcing molded thereinto.

The foregoing objects, advantages, features and results of the present invention, together with various other objects, advantages, features and results thereof which will be evident to those skilled in the sprinkler art in the light of this disclosure, may be achieved with the exemplary embodiments of the invention described in detail hereinafter and illustrated in the accompanying drawing, in which:

FIG. 1 is a side elevational view of a partial circle sprinkler actuated by an oscillatory reaction means on which the reaction-jet-controlling attachment of the invention is mounted;

FIG. 2 is a mirror image of an enlarged, fragmentary sectional view taken along the arrowed line **2**—**2** of FIG. 1, with the attachment of the invention in place;

FIG. 3 is a view similar to FIG. 2, but with the attachment of the invention removed;

FIGS. 4 and 5 are sectional views respectively taken along the arrowed lines **4**—**4** and **5**—**5** of FIG. 2;

FIG. 6 is an isometric view of the attachment shown in FIGS. 1, 2, 4 and 5;

FIGS. 7 and 8 are fragmentary views showing other embodiments of the attachment of the invention mounted on the oscillatory reaction means of the sprinkler; and

FIG. 9 is an isometric view of still another embodiment of the attachment of the invention.

Referring initially to FIG. 1 of the drawing, illustrated therein is a partial-circle, oscillatory-reaction-means-actuated, water sprinkler **10** having mounted thereon a reaction-jet-controlling attachment **12** of the invention. The sprinkler **10** is essentially the same as the sprinkler dis-

closed in Patent No. 2,256,737, granted September 23, 1941, to Orton H. Englehart. Consequently, only a general description is necessary herein.

Briefly, the sprinkler **10** includes a sleeve **14** threadable into an upright coupling **16**, or the like, on a pipe **18**. Journaled in the sleeve **14** is a tubular stem **20** of an angularly movable discharge structure **22** having a nozzle **24** which communicates with the tubular stem and which is adapted to produce a main water jet **26**, FIGS. 2 and 3. Mounted on the discharge structure **22**, for pivotal movement relative thereto about the axis of the stem **20**, is an oscillatory reaction means **28** for displacing the discharge structure angularly in a step-by-step manner. More particularly, the oscillatory reaction means **28** includes an oscillatory driver **30** having a spoon **32** movable into and out of the path of the main jet **26**, being biased toward the path of the main jet by a torsion spring **34** interconnecting the discharge structure **22** and the driver **30**. As shown in FIG. 3, the spoon **32** is provided with an opening **36** through which the main jet **26** passes to impinge on a reaction surface or wall **38**. Such impingement of the main jet **26** on the reaction surface **38** pivots the spoon **32** out of the path of the main jet, against the biasing action of the spring **34**. The result is an oscillatory motion of the driver **30** relative to the discharge structure **22**, and these elements are provided with interengageable anvil portions, not shown, which contact each other during each oscillation of the driver to advance the discharge structure **22** angularly in a step-by-step manner, as is well known in the art. It will be noted that the reaction surface **38** of the conventional spoon **32** produces a laterally directed reaction jet **40**, FIG. 3. The lateral orientation of the reaction jet **40** is subject to the various disadvantages hereinbefore discussed. As will be disclosed in detail hereinafter, the attachment **12** of the invention eliminates such disadvantages.

Carried by the discharge structure **22** is a mechanism **42** for reversing the direction of angular displacement of the discharge structure at the ends of the arc swept by the main jet **26**. The reversing mechanism **42** is actuated by engagement of a pin **44** with stops **46** and **48** on the sleeve **14**. These stops are angularly adjustable relative to the sleeve **14** to adjust the positions of the ends of the arc swept by the main jet **26**.

All of the foregoing structure of the sprinkler **10** is conventional. Consequently, no further description of the sprinkler **10** per se herein is necessary.

Turning now to a more detailed consideration of the attachment **12** of the invention, it comprises a reaction member **50** having a generally S-shaped passage **52** therethrough provided with inlet and outlet ends **54** and **56**. As will be described in more detail hereinafter, the reaction member is mounted on the spoon **32** with the inlet end **54** of the passage **52** in a position to intercept the main jet **26**, upon movement of the spoon into the path of the main jet by the spring **34**, and with the outlet end **56** of the passage facing generally in the direction of the path of the main jet, so as to direct a reaction jet **58**, FIG. 2, produced by the reaction member along a path generally parallel to the path of the main jet. This avoids the problems hereinbefore discussed which are caused by the laterally oriented reaction jet **40**, FIG. 3, produced by the spoon **32**.

The reaction member **50** operates in essentially the same manner as the integral reaction member of the aforementioned Sharp et al. patent. Briefly, it will be noted that the bend in the S-shaped passage **52** adjacent the inlet end **54** thereof produces a reaction force tending to cause the driver **30** to move in the clockwise direction, as viewed in FIG. 2. The bend in the S-shaped passage **52** adjacent the outlet end **56** thereof causes a reaction force tending to move the driver in the opposite direction. These reaction forces are approximately equal, but the one produced by the bend near the outlet end **56** of the S-shaped passage has a longer moment arm than the other. Consequently, the net effect of the diversion of the main jet **26** through the S-shaped passage **52** is to cause displacement of the driver **30** in the counterclockwise direction, as viewed in FIG. 2, in opposition to the biasing action of the spring **34**. Thus, an oscillatory motion is imparted to the driver **30** similar to the oscillatory motion imparted thereto by the cooperation between the main jet **26**, the spoon **32** and the spring **34**. The net effect is actuation of the sprinkler **10** in the same manner as it is actuated by the conventional spoon **32**.

The reaction member **50** is provided thereon with mounting means **60** insertable into the opening **36** in the spoon **32** to mount the reaction member on the spoon. In order to facilitate mounting of the reaction member **50** on the spoon **32** in this manner, and to permit use of the reaction member **50** on sprinklers **10** having spoons **32** with openings **36** of different shapes and sizes, the entire reaction member **50** is made of a suitable elastomeric material, and may have a reinforcing element **62**, preferably metallic, molded thereinto.

The mounting means **60** includes a foot-like projection **64** in which the inlet end **54** of the S-shaped passage **52** is formed and which is insertable through the opening **36** in the spoon **32** so that a portion of such projection lies behind the reaction surface or wall **38** adjacent the corresponding edge **66** of the opening **36**. The projection **64** also engages the opposite edge **68** of the opening **36**, and engages the walls **70** of the spoon **32** on opposite sides of the opening **36**. With this construction, the projection **64** completely closes the opening **36** so that, when the spoon **32** is in a position to intercept the main jet **26**, all of the water in the main jet is diverted into the S-shaped passage **52**. The fact that the reaction member **50** is made of an elastomeric material insures a tight fit in the opening **36** even with variations in the size and/or shape of such opening, such as may be encountered with sprinklers **10** of a given size made by different manufacturers.

It will be noted that the projection **64** on the reaction member **50** and the body of the reaction member are formed to provide a slot **72** on the opposite side of the reaction member from the inlet end **54** of the S-shaped passage **52**. This slot **72** receives therein a portion of the reaction wall **38** of the spoon **32** adjacent the edge **66** of the opening **36**. The result is that the reaction member **50** is positively secured to the spoon **32**.

To further secure the reaction member **50** to the spoon **32**, the reinforcing element **62** is provided with an integral extension **74** which overlies the outer surface of the reaction wall **38** and terminates in a hook **76** engaging the terminal edge **78** of the spoon **32**. It will be noted that the hook **76** positively precludes movement of the reaction member **50** in a direction to disengage the slot **72** from the corresponding portion of the reaction wall **38** of the spoon. Thus, the reaction member **50** is positively secured to the spoon **32** despite the rapid oscillations to which the spoon is subjected.

The particular attachment **12** hereinbefore described represents only one of various forms the invention may take. Others are illustrated in FIGS. 7, 8 and 9 of the drawings, which will now be considered in that order.

Turning to FIG. 7, illustrated therein is an attachment **112** which is similar to the attachment **12**. Consequently, parts of the attachment **112** which correspond to analogous parts of the attachment **12** are identified by reference numerals higher by one hundred than those used to identify the analogous parts of the attachment **12**.

The attachment **112** differs from the attachment **12** in that it has molded thereinto a U-shaped clip **190** embracing the reaction wall **38** adjacent the edge **66** of the opening **36** in the spoon **32**. One arm of the clip **190** extends from the projection **164** of the reaction member **150** into the space between the side walls **70** of the spoon **32**, and carries a screw **192** engageable with the reaction surface **38** to positively secure the reaction member **150** to the spoon **32**.

Turning to FIG. 8 of the drawing, illustrated therein is an attachment 212 comprising a reaction member 250 similar to the reaction member 50. Molded into the reaction member 250 is a U-shaped clip 290 which embraces the exterior surfaces of the side walls 70 of the spoon 32 therebetween. The clip 290 is provided with a tab 292 to which one end of a tension spring 294 is connected, the other end of such spring being connected to a hook 296 engaging the terminal edge 78 of the spoon 32. Thus, the reaction member 250 is secured in place by the hook 296 in substantially the same manner as the reaction member 50 is secured in place by the hook 76. Interposing the spring 294 between the clip 290 and the hook 296 makes it easier to engage the hook 296 with the terminal edge 78 of the spoon 32.

Referring to FIG. 9, illustrated therein is an attachment 312 comprising a reaction member 350 substantially identical to the reaction member 50, the same reference numerals being applied. The only difference is that the sides of the inlet end 54 of the S-shaped passage 52 are formed by relatively thin webs 390 molded integrally with the reaction member 350 and extending between the heel of the projection 64 and the body of the reaction member. When the reaction member 350 is mounted on the spoon 32, the webs 390 snugly engage the side walls 70 of the spoon 32 to insure a water-tight seal.

Although various exemplary embodiments of the invention have been disclosed herein for purposes of illustration, it will be understood that various changes, modifications and substitutions may be incorporated in such embodiments without departing from the spirit of the invention as defined by the claims which follow:

1. In combination with a sprinkler which includes an angularly movable discharge structure having a nozzle for producing a main jet, and which includes reaction means operable by said main jet, and normally producing a laterally-directed reaction jet, for displacing said discharge structure angularly in a step-by-step manner, said reaction means comprising an oscillatory driver having a spoon movable into and out of the path of said main jet and provided with an opening therethrough for said main jet, an attachment for producing a reaction jet directed along a path generally parallel to the path of said main jet, comprising:

(a) a reaction member having a generally S-shaped passage therethrough provided with inlet and outlet ends; and

(b) means on said reaction member and inserted into, said opening for mounting said reaction member on said spoon with said inlet end of said passage in a position to intercept the path of said main jet, upon movement of said spoon into the path of said main jet, and with said outlet end of said passage facing generally in the direction of the path of said main jet, so as to direct a reaction jet produced by said reaction member along a path generally parallel to the path of said main jet.

2. In combination with a sprinkler which includes an angularly movable discharge structure having a nozzle for producing a main jet, and which includes reaction means operable by said main jet, and normally producing a laterally-directed reaction jet, for displacing said discharge structure angularly in a step-by-step manner, said reaction means comprising an oscillatory driver having a spoon movable into and out of the path of said main jet and provided with an opening therethrough for said main jet, an attachment for producing a reaction jet directed along a path generally parallel to the path of said main jet, comprising:

(a) a reaction member having a generally S-shaped passage therethrough provided with inlet and outlet ends; and

(b) yieldable elastomeric means on said reaction member and inserted into said opening for mounting said reaction member on said spoon with said inlet end of said passage in a position to intercept the path of said main jet, upon movement of said spoon into the path of said main jet, and with said outlet end of said passage facing generally in the direction of the path of said main jet, so as to direct a reaction jet produced by said reaction member along a path generally parallel to the path of said main jet.

3. A reaction-jet-controlling attachment for a sprinkler which includes an angularly movable discharge structure having a nozzle for producing a main jet, and which includes reaction means operable by the main jet, and normally producing a laterally-directed reaction jet, for displacing the discharge structure angularly in a step-by-step manner, the reaction means comprising an oscillatory driver having a spoon movable into and out of the path of the main jet and provided with an opening therethrough for the main jet, said attachment being capable of producing a reaction jet directed along a path generally parallel to the path of the main jet, and comprising:

(a) a reaction member having a generally S-shaped passage therethrough provided with inlet and outlet ends; and

(b) means on said reaction member and inserted into the opening in the spoon for mounting said reaction member on the spoon with said inlet end of said passage in a position to intercept the path of the main jet, upon movement of the spoon into the path of the main jet, and with said outlet end of said passage facing generally in the direction of the path of the main jet, so as to dircct a reaction jet produced by said reaction member along a path generally parallel to the path of the main jet.

4. A reaction-jet-controlling attachment for a sprinkler which includes an angularly movable discharge structure having a nozzle for producing a main jet, and which includes reaction means operable by the main jet, and normally producing a laterally-directed reaction jet, for displacing the discharge structure angularly in a step-by-step manner, the reaction means comprising an oscillatory driver having a spoon movable into and out of the path of the main jet and provided with an opening therethrough for the main jet, said attachment being capable of producing a reaction jet directed along a path generally parallel to the path of the main jet, and comprising:

(a) an elastomeric reaction member having a generally S-shaped passage therethrough provided with inlet and outlet ends; and

(b) said reaction member having adjacent said inlet end of said passage a yieldable portion which is inserted into the opening in the spoon to mount said reaction member on the spoon with said inlet end of said passage in a position to intercept the path of the main jet, upon movement of the spoon into the path of the main jet, and with said outlet end of said passage facing generally in the direction of the path of the main jet, so as to direct a reaction jet produced by said reaction member along a path generally parallel to the path of the main jet.

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EVERETT W. KIRBY, *Primary Examiner.*