

July 10, 1962

C. W. RYERSON
SPRINKLER CONSTRUCTION

3,043,522

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2 Sheets-Sheet 1

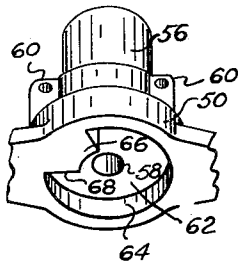
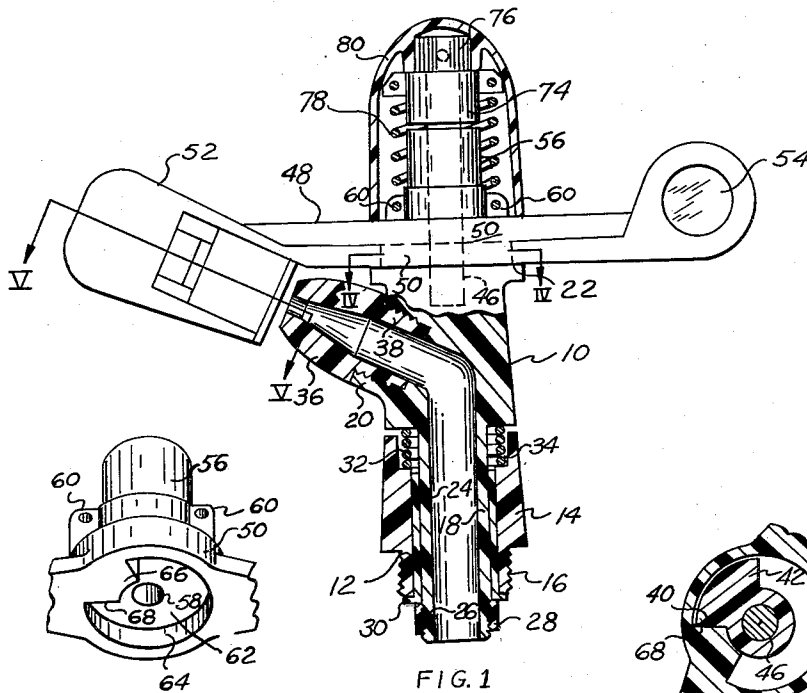


FIG. 2

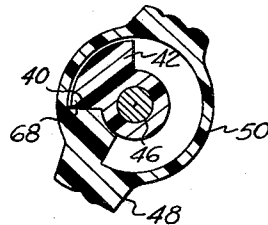


FIG. 4

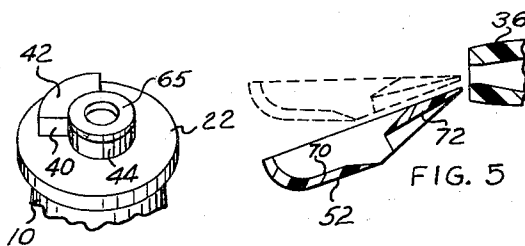


FIG. 3

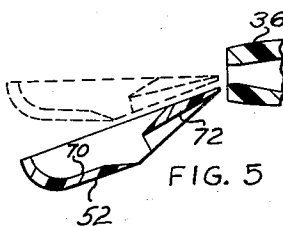


FIG. 5

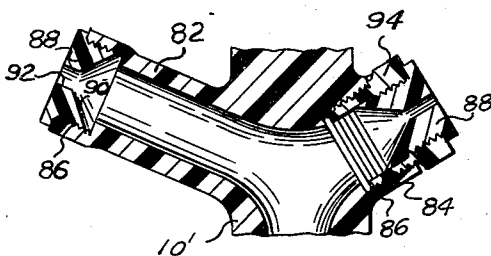


FIG. 7

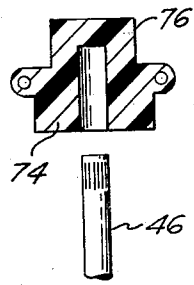


FIG. 6

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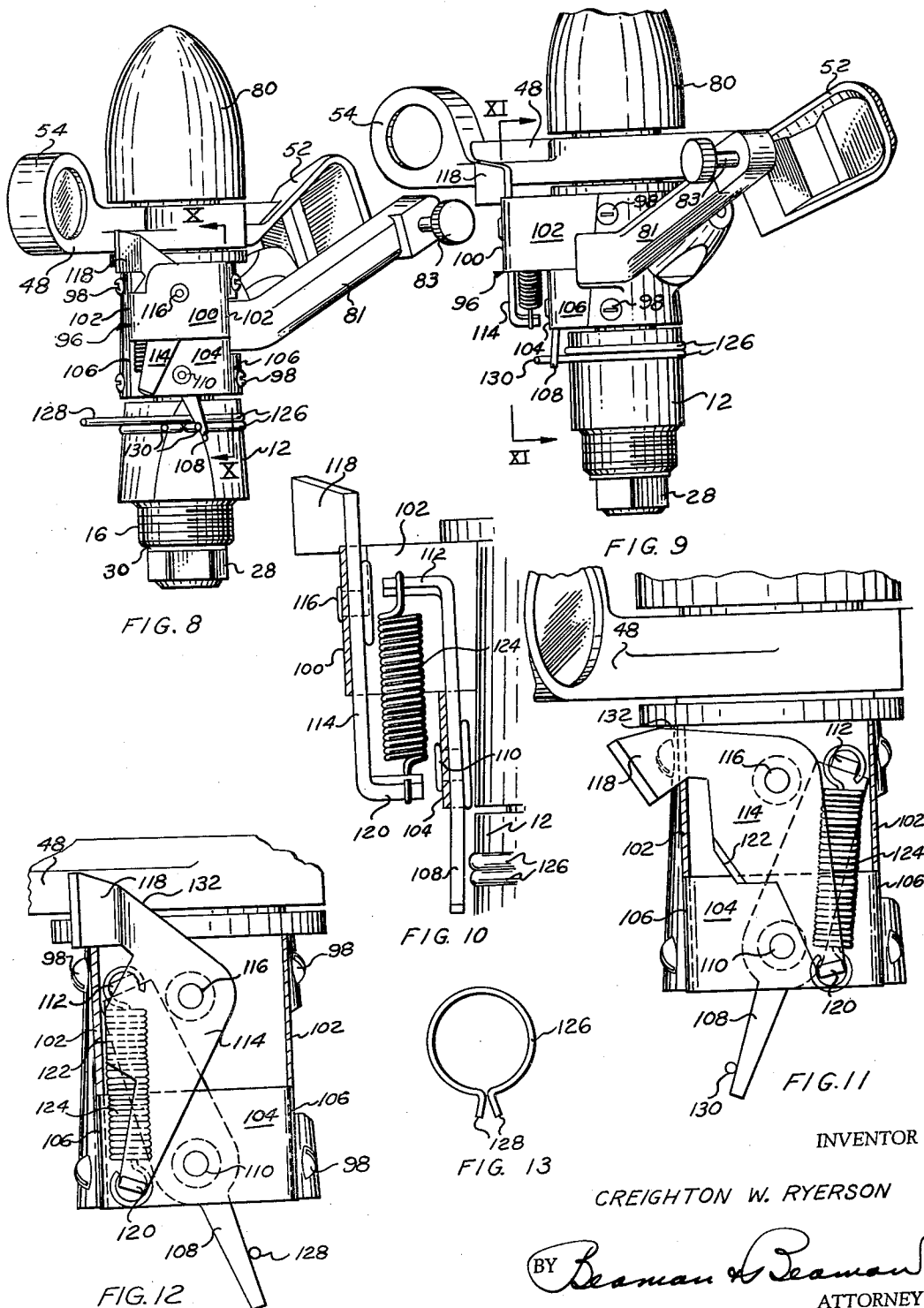
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SPRINKLER CONSTRUCTION

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5 Claims. (Cl. 239-230)

The invention relates to a water sprinkler head and particularly pertains to a rotatable sprinkler head which is rotated intermittently by an impulse arm.

Sprinkler heads which are rotated by impulse arms actuated by the reaction of a stream of water upon the arm, causing the arm to be deflected against a spring which returns the arm for rotational impact with the head, are well known in the sprinkler art as typified by United States Patent No. 1,997,901. The present invention relates to an improved construction of this type of sprinkler and is particularly concerned with a sprinkler construction which lends itself readily to manufacture by molding, and which may be formed of a non-metallic plastic material.

A further object of the invention is to provide an oscillating sprinkler construction rotated by an impulse arm wherein the abutment surfaces of the sprinkler head and arm are specifically formed for such purposes and are incorporated within the configuration of the sprinkler components.

Another object of the invention is to provide a molded sprinkler construction wherein the number of components is reduced with respect to conventional construction and machining of the components after casting is also reduced.

A further object of the invention is to provide a sprinkler construction which is highly resistant to damage by corrosion and other chemical reactions and which wears slowly, having replaceable components in the wear areas such as the nozzle.

Yet another object of the invention is to provide an automatic reversing attachment for use with a sprinkler of the impulse type which will permit the sprinkler to operate through a portion of a circle, and which may be easily attached to full circle sprinklers.

These and other objects of the invention of the invention, resulting from the structural relationship and details, will be apparent from the following description and accompanying drawing wherein:

FIG. 1 is an elevational view of a sprinkler in accord with the invention, portions thereof being illustrated in section.

FIG. 2 is a detail perspective view of the abutment recess defined in the impulse arm,

FIG. 3 is a detail perspective view of the abutment formed on the sprinkler body,

FIG. 4 is a plan sectional view of the abutment structure of the arm and body as assembled and taken along the line IV-IV of FIG. 1,

FIG. 5 is a sectional view of the impulse arm deflector, showing the deflected position in dotted lines,

FIG. 6 is an elevational, partially sectioned view of the spring anchor cap and pin,

FIG. 7 is a sectional elevational view of a modification of a body and nozzle construction,

FIG. 8 is an elevational view of a sprinkler in accord with the invention, having a reversing attachment thereon,

FIG. 9 is an elevational view taken from the right of FIG. 8,

FIG. 10 is a sectional, elevational view taken along line X-X of FIG. 8,

FIG. 11 is a sectional, elevational view taken along line XI-XI of FIG. 9, showing the reversing abutment in the inoperative position,

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FIG. 12 is a view similar to FIG. 11, showing the reversing abutment in the operative position and

FIG. 13 is a view of one of the reversing clips as may be used with the invention.

While the sprinkler described herein could be manufactured from common moldable metals, it is preferred that the primary components, such as the body, arm and base, be formed of an inert, hard plastic or synthetic rubber compound. One desirable material being a blend of copolymers of styrene-acrylonitrile resin and butadiene-acrylonitrile rubber, commercially known as "Kraylastic" or "Cycolac."

Referring to FIG. 1, wherein the assembled sprinkler components are best illustrated, it will be observed that the body 10 of the sprinkler is rotatably supported in a tubular base 12. The base 12 is provided with an internal axis bore and an enlarged external portion 14 on which a roughened hand gripped surface or wrench engaging plates may be formed. A threaded section 16 is also provided on the base whereby the base may be affixed to a riser pipe, valve key, or other supporting member through which water under pressure is supplied to the sprinkler.

The sprinkler body 10 is shown in its most simplified form, wherein a single nozzle member is employed, and includes a cylindrical shank 18 which extends through the bore of the base 12, a nozzle supporting portion 20 and a planar abutment supporting surface 22 disposed on the top of the body at right angles to the axis thereof. A passageway 24 extends through the body 10, communicating at the lower end, FIG. 1, with the conduit of the base supporting member, not shown, and is deflected at the nozzle support region at an angle approximately 65° from the axis of the body shank 18. The shank is threaded at 26 and a tubular bushing 30, having a lower radial shoulder, is interposed between the base 12 and shank 18. A nut 28 is threaded upon threads 26 and makes sealing engagement with the radial shoulder of bushing 30. A compression spring 32 is interposed between the body 10 and base 12 and is located within a body recess 34 to maintain a sealing engagement of the bushing 30 with the nut 28 regardless of the pressure of the water being distributed. The fluid pressures exerted on the body are sufficient to maintain a sealing connection at the bushing when the water pressures are above 15 p.s.i. However, the use of spring 32 insures a rotary fluid-tight connection at lower pressures.

The nozzle supporting portion 20 of the body is interiorly threaded concentric with the deflected portion of the passageway 24 to receive a replaceable plastic nozzle 36 having a threaded portion 38. The axial passage of the nozzle communicates with that of the body 10 and converges to a restricted opening to increase the velocity of the water passing through the nozzle. It will be apparent that the nozzle 36 may be easily removed from the sprinkler body for cleaning or replacing and by making the nozzle of a non-corrosive plastic material, wear due to abrasion is reduced and the nozzle opening will not corrode closed.

The upper region of the body 10 is formed with the aforementioned abutment supporting surface 22 and the abutment elements of the body arise from this surface. The abutment surface 40 is formed on a wedge shaped projection 42 molded as an integral part of the body 10 and the surface 40 acts as a stop to receive the impact of the impulse arm and hence rotate the body step by step as will be later apparent. A hole 44 is formed in the body 10 to receive a pin 46 which is forced into the hole in a fixed relationship with the sprinkler body. FIG. 3 shows the body abutment members before the pin 46 has been inserted into hole 44.

The impulse arm 48 consists of a balanced, molded,

plastic element having a hub 50 and a pair of opposed radial arms on which are respectively mounted a paddle 52 and a counterweight 54. An upright extension 56 is formed integral with and on the top of the hub 50 and is provided with a bore 58 through which the pin 46 may project and rotatably mount the arm on the body. A pair of spring anchors 60 are also provided on the extension 56 adjacent the hub.

The underside of hub 50 is recessed at 64, FIG. 2, to receive the wedge portion 42 therein. Recess 64 is substantially circular except for the stop 66 forming the abutment surface 68, and is defined at the top by a surface 62. It will be thus understood that when the arm and body are assembled as described, clockwise rotation of arm 48 will be prevented upon engagement of abutment surface 68 with abutment surface 40 of the body. A nylon washer 65 circumscribing pin 46 and resting upon wedge 42 will bear against surface 62 and support the weight of arm 48.

The paddle 52 is best illustrated in FIG. 5 and consists of a primary reaction surface 70 which is angularly disposed to the water stream emitting from nozzle 36 whereby water striking surface 70 will rotate the impulse arm 48 in a counter clockwise direction as viewed from the top. A secondary surface 72, in spaced relation to the primary reaction surface, also forms a part of the paddle and is disposed as to aid the impulse arm in returning to the original arm position as shown in dotted lines in FIG. 5. Thus, as the deflected paddle returns back into the path of the water stream, the stream will first engage surface 72, giving added impulse to the returning arm and insure that the arm rotation is terminated by direct engagement of the abutment surfaces 40 and 68.

A spring anchor cap 74 is affixed to the top of pin 46 and is formed with a cylindrical portion 76 which holds the cover cone in place as will be later apparent. A recoil spring 78 is affixed at one end to the spring anchors of the cap and at the other end to the spring anchors 60 of the impulse arm. The coils of spring 78 are wound in a left hand direction, such that the spring is wound when the impulse arm is rotated counter clockwise by the reaction of the water on paddle surface 70. The cap 74 is affixed to the pin 46 by pressing the spring 78 to be accurately pre-tensioned before the cap is pressed in place. The spring and adjacent components may be encompassed by a cover cone 80 having a recess to receive portion 76 in a press fit, thereby indirectly affixing the cone to the pin 46.

A radial arm 81 may be affixed to body 10 adjacent the nozzle support portion 20, FIGS. 8 and 9, and mounts a screw 83 which engages the fluid stream to break the stream to provide better water distribution.

The sprinkler operation is as follows: Due to the torque exerted by spring 78, which is slightly pre-wound, the normal position of the impulse arm on the sprinkler body 10 will be when the abutment surfaces 40 and 68 are in mutual contact, FIG. 4, and the paddle 52 is related to the nozzle 36 as shown in the dotted lines of FIG. 5. As the water stream strikes reaction surface 70, the arm rotates in a counter clockwise direction, winding the spring 78. As the torque of the spring overcomes the inertia of the arm, the spring 78 will rotate the arm in a clockwise direction to bring the paddle 52 back into the water stream. As the rightmost edge of surface 72, FIG. 5, is the first paddle portion engaged by the water, the arm is given an additional clockwise "kick," whereupon the arm abutment surface 68 will sharply engage the body abutment surface 40, rotating the body 10 in the base 12 several degrees. At this point the water stream engages the primary reaction surface 70 and the cycle is repeated to rotate the sprinkler body in increments of a few degrees, each cycle thereby distributing the water flowing through the nozzle in a 360° circle.

As the sprinkler body rotates in the base 12, the primary wear occurs at the nylon bushing 30. However, due to the base 12 being formed of a plastic and the lubricating character of the water and the nylon itself, the bushing will perform satisfactorily for several years under normal usage before replacement is required. By incorporating the abutment surfaces into the body and arm in the described manner, the possibility of foreign matter interfering with the operation of these parts is minimized and a clean, attractive appearance is achieved which is enhanced by the use of the cover cone 80. By forming the shank 18 as an integral part of the body 10, an economical construction is provided which insures that the axis of the shank will coincide with the axis of the circular movement of the body. The described embodiment readily lends itself to conventional plastic molding procedures and a comparable sprinkler may be produced of an inert plastic much more economically than with conventional brass, aluminum or steel construction.

A modification of a sprinkler body is shown in FIG. 7 wherein the body 10' is provided with means for discharging water through two nozzles and wherein a modification of a nozzle is disclosed. Body 10' is provided with an extended lateral portion 82 and a lateral portion 84 which is not extended. Both portions constitute passageways which communicate with the axial passage of the body. Both portions are interiorly threaded at 86 and a nozzle 88 of nylon, or other inert, wear resistant material, may be threaded into the end of portion 82. Nozzle 88 is provided with an orifice having a converging bore 90 and a cylindrical bore 92. The diameter of bore 90 will be determined by the water pressure and the manner in which the sprinkler is being used. The outer end of the nozzle may be formed with flats for cooperation with a wrench to facilitate insertion and removal of the nozzle. The water emitting from the nozzle of portion 82 strikes the impulse paddle, as described above, and rotates the body 10' in the disclosed manner.

An adapter 94 of a plastic material is threaded into lateral portion 84 and a nozzle 88 threads into the adapter to provide a spray of water in the opposite direction to that flowing from portion 82. This flow stream will not be interrupted by an impulse paddle and substantially increases the range and capacity of the sprinkler. A tubular extension may be threaded into portion 84 in place of the adapter 94 and a nozzle screwed into the free end of the extension to provide extra range and greater area coverage.

It is often desired to water an area of small or unusual shape wherein a sprinkler of the described type, moving through 360°, will throw water upon a house or sidewalk during watering of the desired area. To control the area covered by the sprinkler, wherein portions of a circle less than 360° are to be watered, a reversing attachment may be affixed to body 10 to reverse the direction of body rotation after movement through a desired arc. The reversing attachment may take the form shown in FIGS. 8-12, wherein a sheet metal support member 96, preferably of brass or other non-ferrous material, is affixed to body 10 by screws 98. Support 96 consists of a pair of U-shaped portions of different leg dimensions, the first portion defined by a base element 100 having a pair of spaced parallel leg elements 102 and the second portion is defined by a base element 104 and leg elements 106. These U-shaped portions are formed whereby legs 102 are greater in length than legs 106, locating base 100 at a greater distance from the axis of the body 10 than base 104.

A trip lever 108 is pivotally mounted at 110 to the inside of base element 104 and is provided with a lower portion which extends below the support 96 and an upper portion 112 which is bent outwardly to form a spring anchor.

A stop lever 114 is pivotally mounted on the inside of

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base 100 at 116 and is formed with an upper abutment 118 and a lower spring anchor 120. Lever 114 is also provided with a stop surface 122 which is vertically disposed below the pivot 116 and engages the inside of one of the leg elements 102 as will be later apparent.

A spring 124 is interposed between levers 108 and 114, being connected to anchors 112 and 120 and as pivots 110 and 116 are disposed in vertical relation and the spring anchors are adapted to move to opposite sides of the plane of the pivot axes, movement of the trip lever 108 to the position of FIG. 11 will result in the stop lever moving to the illustrated position wherein the spring anchors will be on the same side of the pivot axes plane. Likewise, shifting the trip lever to the position of FIG. 12 will cause the stop lever to move clockwise. It will be appreciated that upon movement of the trip lever 100 from the position of FIG. 11 to that of FIG. 12 the stop lever 114 will not move until the spring anchor 112 travels past the plane containing the axis of pivot 110 and anchor 120, at which time the spring will exert an "off center" pull on the stop lever and shift the stop lever to the position of FIG. 12 with a snap action. A similar snap action takes place in moving lever 114 from the position of FIG. 12 to that of FIG. 11 upon a reversal of the pivoting movement of the trip lever.

It will be noted in FIGS. 8-12 that the reversing attachment is positioned on the body 10 such that the abutment portion 118 of the stop lever 114 will move from the non-interference position, with the counterweight half of the impulse arm 48, of FIG. 11 to the position of FIGS. 8, 9, 10 and 12 wherein the abutment 118 will be within the rotative plane of the impulse arm and be engaged by the counterweight half of the arm.

As explained above, the rotative motion of the body 10 is produced by the engagement of abutment surfaces 40 and 68 under the influence of the recoil spring 78 acting on the impulse arm 48. As viewed from above the sprinkler, this action will rotate the body 10 clockwise. When the abutment 118 is moved to the position of FIG. 12, wherein the impulse arm will engage the abutment 118, the arm will be moving counter-clockwise due to the reaction of the water on the paddle 52, stop lever 114 will be prevented from rotating clockwise due to the engagement of stop surface 122 with the left leg 102, FIG. 12, and hence a counter-clockwise impulse will be transferred to body 10, through support 96, to impart a counter-clockwise rotation to body 10. At this time recoil spring 78 will rotate the impulse arm to move paddle 52 back into the water stream to cause the arm to rotate counter-clockwise again, strike abutment 118 and again rotate body 10 in a like direction. Upon shifting of the trip lever to the position of FIG. 11, the abutment 118 will swing clear of the arm 48 and the sprinkler may once again rotate in a clockwise direction upon engagement of the abutment surfaces 40 and 68 as the impulse arm is unrestricted during the counter-clockwise movement.

The shifting of the trip lever 108, and hence the stop lever 114, is accomplished automatically by adjustable means mounted on the base 12. These means may take the form of a pair of annular wire clips 126 maintained in a groove circumscribing the base by the resiliency of the clip and each clip is provided with at least one end which projects radially with respect to the axis of body 10, note FIG. 13. For purposes of explanation, the radial ends of the upper clip is designated 128 and the radial ends of the lower clip 130. These clips may take the form shown in U.S. Patent No. 2,256,737 if desired.

The clips 126 are radially positioned on the body 10 whereby the angular displacement between the ends 128 and 130 is substantially equal to the arc of the circle which is to be watered. The lower end of trip lever 108 will extend below the horizontal plane of the clip and lie between the clip ends in the arc to be watered. Assuming the levers of the reversing attachment to be in the position of FIG. 11, the body 10 will be rotating

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clockwise and the clip will be stationary. As the attachment moves to the left, FIG. 11, the clip end 130 will engage the lower end of trip lever 108, and continued clockwise sprinkler rotation will shift lever 108 to the position of FIG. 12. At this time the components will be arranged as in FIG. 8.

As the abutment 118 is now engaged by the impulse arm 48, the sprinkler will rotate in a counter-clockwise direction as explained above and the reversing attachment will be moving to the right as viewed in FIGS. 11 and 12. Reversing continues until the clip end 128 is engaged by lever 108 to shift the parts into the position of FIG. 11 to restore the normal sprinkler action.

In locating the reversing attachment on the body 10, the attachment is positioned such that the impulse arm 48 will engage the abutment 118 after about 15° of rotation from the water stream to insure that the sprinkler will reverse even under low water pressure conditions. In practice, it sometimes happens that the trip lever 108 is shifted from the position of FIG. 11 to that of FIG. 12 when the impulse arm is directly over the abutment portion 118. However, this will cause no difficulty as the parts are positioned such that the stop lever will be merely held from completely shifting by the impulse arm and as soon as the arm clears the abutment 118, the stop lever 114 will fully shift to the position of FIG. 12 under the influence of spring 124. By beveling lever 114 at 132, the impulse arm 48 will retract the stop lever during the backstroke of the arm if, at the movement of stop lever 114 shifting, the impulse arm moves over the abutment 118 under the above circumstance.

I claim:

1. A fluid distributing sprinkler comprising a base member adapted to be affixed to a pressurized fluid source, a body member rotatably mounted in said base member, conduit and nozzle means carried by said body in communication with a fluid source, rotary support means mounted on said body concentric to the axis of rotation thereof, an impulse arm rotatably journaled on said support means having a hub and a planar surface adjacent said body member, paddle means carried by said arm adapted to be engaged by and deflected from the fluid stream emitting from said nozzle whereby said arm is rotated relative to said body, a first abutment surface formed on said body adjacent said rotary support defined by a projection extending from said body, a second abutment surface formed on said impulse arm adapted to engage said first surface, said second surface defined within a recess formed in said arm hub opening into said planar surface receiving said projection and recoil spring means interposed between said body and arm adapted to be wound upon rotation of said arm by the reaction of fluid on said paddle and return said paddle to the fluid stream whereby on said return movement of said arm said second surface engages said first surface to impart an impulse to said body producing intermittent rotation thereof.

2. In a fluid distributing sprinkler as in claim 1 wherein said nozzle is removably mounted in said body and said base, body, nozzle and arm are molded of an inert, non-corrosive, plastic material.

3. In a fluid distributing sprinkler as in claim 1 wherein said recess defined in said arm is substantially circular and is concentric with respect to the axis of rotation of said arm upon said body.

4. A removable reversing attachment for use with a fluid distributing sprinkler having a rotatably supported body, conduit and nozzle means communicating with a pressurized fluid source mounted upon said body, an impulse arm rotatably mounted on said body adapted to be oscillated by fluid emitting from said nozzle means, abutment means formed on said arm for engagement with said body upon rotation of said arm in a first direction to rotate said body, said reversing attachment comprising support means attachable to the sprinkler body by fastening means, said support means including a first support mem-

ber and a second support member, said first support member being a greater distance from said body than said second support member, an elongated stop lever pivotally mounted on said first support member having an abutment portion and a spring anchor portion projecting toward said second support member formed at opposite ends thereof, an elongated trip lever pivotally mounted in said second support member having a spring anchor projecting toward said first support member and an actuating portion formed at opposite ends thereof, a spring interposed between and interconnecting said stop and trip lever anchor portions whereby predetermined movement of said trip lever exerts an off-center force on said stop lever to pivot said stop lever with a snap action, said stop lever abutment portion being positionable into the path of the impulse arm at one position of said stop lever whereby movement of said arm in the direction opposite to said first direction engages said stop lever abutment portion to reverse the rotation of the sprinkler body and means actuating said trip lever upon the body rotating to given rotative positions.

5. In a reversing attachment as in claim 4 wherein a stop surface is defined on said stop lever for cooperation with said support means during engagement of said abut-

ment means with said arm, said stop surface being vertically disposed below said abutment means and the pivot of said stop lever being vertically disposed intermediate said stop surface and said abutment means.

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