

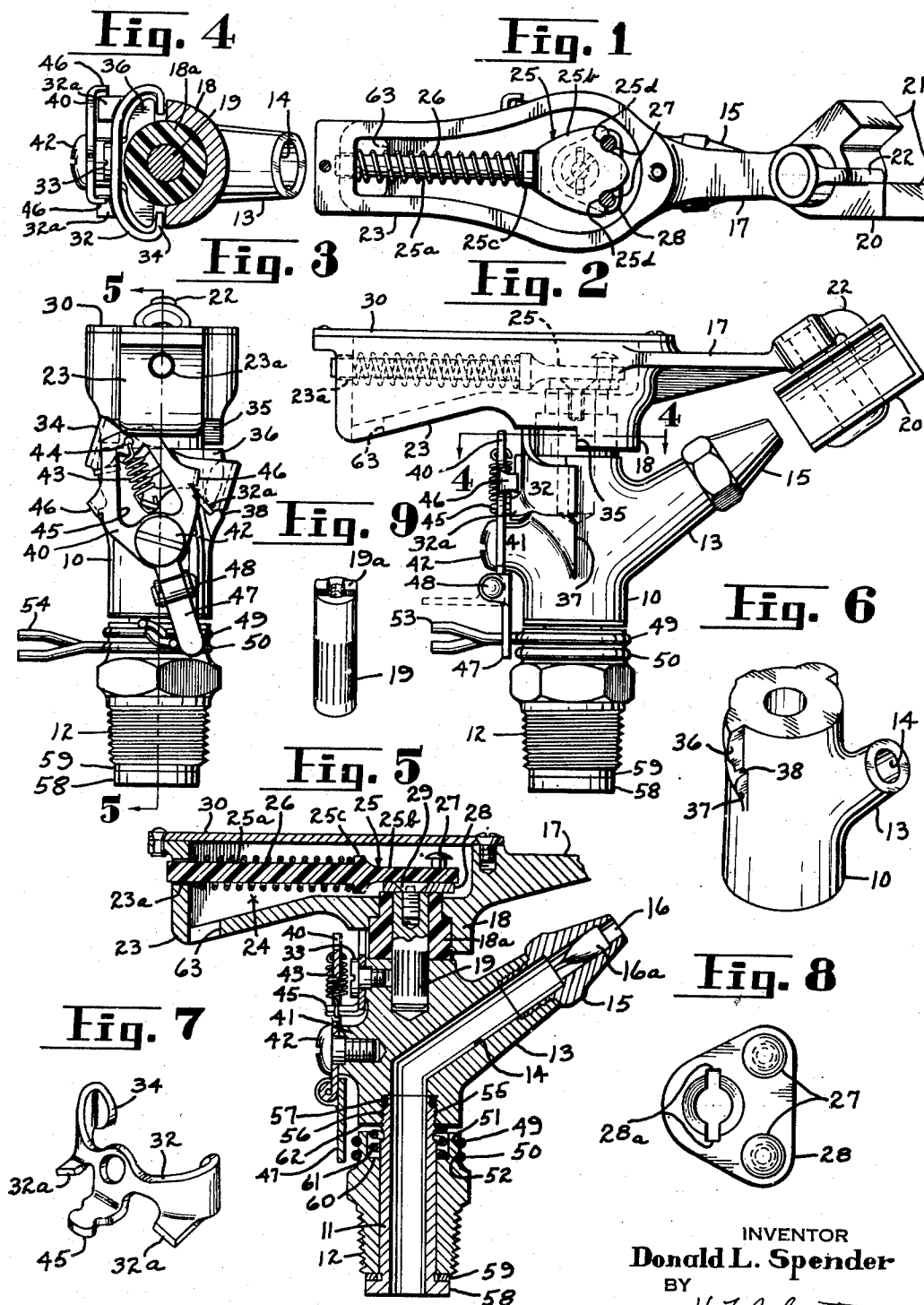
Nov. 6, 1956

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2,769,666

IMPULSE OPERATED SPRINKLER

Filed Feb. 1, 1954



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IMPULSE OPERATED SPRINKLER

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Application February 1, 1954, Serial No. 407,233

4 Claims. (Cl. 299—69)

This invention relates to sprinklers having intermittent rotary movement. More particularly the invention has to do with improvements in sprinklers of the type having means for rotating the sprinkler head step by step, such movements being produced by an impulse arm pivoted on the sprinkler head and which is oscillated to opposite sides of the stream of water issuing from the sprinkler head by the force of the stream. Preferably also the direction of rotation of the sprinkler head is automatically controlled and reversed at predetermined positions.

In such sprinklers there has been employed a double acting coil spring for the purpose of returning the impulse arm to neutral position from which it is swung to either side of the stream by the force of the water. This has been a cumbersome and troublesome affair and according to my invention the impulse arm is centered by means of a simple linearly acting compression spring acting against stops disposed equidistant on opposite side of the dead center line of the oscillating head, which mechanism is enclosed neatly in the impulse arm itself.

Another difficulty is involved with the movable stop means on the sprinkler member which is struck by the impulse arm in those sprinklers which are reversible so as to cover only part of a circle. The impact of the impulse arm had to be carried to the sprinkler head through the pivotal mounting of such movable stop means so that the operation was at best unreliable, especially in the lower ranges of water pressure. According to my invention such impacts are transmitted much more directly to the sprinkler head without having to be transmitted through the mounting of the movable stops. This also makes for lightness and cheapness of the reversing device.

Another object is to provide a simple escapement to the movable stops to delay the reversing operation until the maximum tension is created in the operating spring of the reversing mechanism to assure that the movable stops will act quickly and positively at the proper time sequence.

Other objects and advantages of the invention will be apparent from the following description and the accompanying drawing in which,

Fig. 1 is a top plan view of the sprinkler device embodying the present invention, with the cover plate of the swinging arm removed.

Fig. 2 is a side elevation of the same.

Fig. 3 is a rear end view of the same.

Fig. 4 is a transverse section taken along the line 4—4 of Fig. 2.

Fig. 5 is a vertical sectional view taken along the line 5—5 of Fig. 3.

Fig. 6 is a perspective view of the sprinkler head body, per se.

Fig. 7 is a perspective view of the movable stop yoke forming a part of the reversing mechanism, and

Fig. 8 is a plan view of the stop pin anchor plate located in the swinging arm.

Fig. 9 is a perspective view of the pivot pin, per se. Referring more particularly to the drawing, the refer-

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ence numeral 10 designates a rotary sprinkler head or body having a depending tubular spindle 11 rotatably mounted in a support, which herein is a threaded nipple 12 by means of which the sprinkler can be mounted on the end of a pipe or a suitable stand. The head 10 is integrally formed with a lateral upwardly directed nozzle 13 having a central passage 14 communicating with the tubular spindle 11. A nozzle tip 15 is threadedly secured to the end of the nozzle 13 and is formed with a reduced outlet port 16 within which is fitted a spiral blade 16a designed to produce the desired water discharge from the sprinkler unit.

The sprinkler head 10 is adapted to be intermittently moved about its axis at a comparatively slow rate of speed so that the stream of water issuing from the nozzle tip 15 will slowly move over different portions of the area to be sprinkled, and, as herein shown, the means by which the sprinkler head is moved is one operated by the water flowing through the sprinkler member after it issues from the nozzle tip 15. This means comprises an impulse arm 17 having a central hub 18 within which is secured a shouldered bushing 18a rotatable on a spindle shaft 19 projecting axially upwardly and secured to the body 10. The bushing 18a is preferably made of nylon material so as to reduce friction between the movable parts and provide longer life.

Pivotaly supported on the outer end of the arm 17 and adapted to oscillate between predetermined limits is a wedge-shaped driver or water deflector vane 20 positioned to have its apex facing the nozzle tip 15 and operating in a manner well known to this type of sprinkler, it being understood that the vane reverses its position each time it passes through the stream. The oscillating movement of the vane 20 is limited by a pair of integral projections 21 on said vane opposite from its apex, and these projections 21 are adapted to laterally butt against a rigid stop lug 22 on the arm 17.

A counter-balancing tailpiece 23 extends from the hub 18 directly opposite from the arm 17. The tailpiece 23 and hub 18 are formed to provide a chamber 24 opening through their upper surfaces and within which is positioned the mechanism for returning the impulse arm 17 to its normal dead-center position. This mechanism consists of a plunger yoke-bar 25 having a rod section 25a slidably fitted in a bearing hole 23a in the end wall of the tailpiece 23. The opposite end of the yoke-bar 25 is formed with a plate section 25b joined to the rod section 25a with a shoulder flange 25c. A compression coil spring 26 surrounds the rod section 25a and normally urges the yoke-bar 25 to the right as viewed in Fig. 1. The plate section 25b is formed with edge recesses 25d that normally engage a set of spaced headed pins 27 projecting upwardly from an anchor plate 28 made secure to the upper end of spindle 19 by screw 29. The spindle 19 is provided with a pair of extensions 19a (see Fig. 9) at its upper end that engage in complementary slots 28a in the anchor plate 28 (see Fig. 8) to prevent the anchor plate 28 turning relative to the body 10, and, incidentally, the anchor plate 28 serves to hold the impulse arm 17 upon its spindle 19. The open end of the chamber 24 may be closed off by a cover plate 30 to conceal and protect the arm-return mechanism.

It will be noted that the yoke-bar 25 under the influence of compression spring 26 is normally abutted against both anchor plate pins 27 to return the impulse arm 17 in line with the plane in which it is normally disposed when at neutral position with the deflector vane 20 in line with the nozzle 15. When the arm 17 is swung in either direction about its axis the distance between the pins 27 and the bearing support 23a of the yoke-bar 25 will shorten up so that the compression of the spring 26 will be proportionately increased to return

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said impulse arm to its normal center position. As well understood in this type of sprinkler, the arm 17 swings to one side or the other of its normal center by the water jet issuing from the nozzle tip 15 and impinging against one or the other surfaces of the wedge-shape deflector vane 20 to a distance as determined by the compression of said spring, whereupon the rotation of said arm is reversed under the expansion influence of the spring 26 to impart a progressively increasing rotary motion to said arm until projection 35 of the latter abuts a stop projection carried by the sprinkler head so that the kinetic energy stored in said arm will cause the head to rotate a step in a like direction about its axis.

The mechanism for transmitting the kinetic energy of the arm 17 intermittently to the head 10 and for reversing the direction of rotation of the sprinkler head will now be described. A yoke 32, best shown in Fig. 7, is pivotally mounted on the sprinkler head as by a pivot screw 33 and is formed with intumed wings or stops 34 at its opposite ends. This yoke 32 is adapted to be tilted to two different positions whereupon one of the stops 34 will be struck by hammer projections 35 integral with and extending outwardly from opposite sides of the hub 18 of the impulse arm 17. As shown in Fig. 3 when the left stop 34 is raised and aligned with the left hub projection 35 of the impulse arm 17 said projection 35 will strike thereagainst every time said arm is making a return swing in a counterclockwise direction as viewed in Fig. 1 and consequently gives an impulse thrust to the head 10 to rotate it a small distance in the same direction.

It will be apparent that numerous hammer-like blows will be imparted to the stop wings 34 by the hammer projections 35 on the impulse arm 17, and in order to backup the stops 34 and also to transmit the effect of the hammer-like blows more directly to the sprinkler head 10 rather than indirectly through the stop wings 34, yoke 32 and pivot screw 33 to said head, a pair of backing-up lugs 36 is formed outwardly from opposite sides of the body 10 and so positioned as to lie directly against the stops 34 when either one or the other is in its uppermost position. The amount of tilt allowed for the yoke 32 is determined by another pair of lugs 37 projecting outwardly from the body 10 immediately below the lugs 36 and presenting upwardly-facing shoulders 38 against which each stop 34 may rest when one arm or the other of the yoke 32 is tilted to its lowermost position.

The yoke 32 is automatically controlled to shift from one tilted position to another by means of a toggle lever 40 pivoted to a projection 41 on the body 10 as by a pivot screw 42. The lever 40 is provided with an opening 40a in its upper section in which is located a coiled tension spring 43 having one end attached to said lever as at 44 while the opposite end of the spring is connected to an ear 45 projecting from the under edge of the yoke 32 directly in line with the pivot screw 33. With this construction and arrangement of parts it will be obvious that when the upper end of the toggle lever 40 is disposed to the left of the center line of the sprinkler unit, as viewed in Fig. 3, the left hand stop 34 of the yoke 32 will be disposed in the uppermost position in line with the left hammer lug 35 of the impulse arm while the right stop 34 will be in lowermost position resting on the right shoulder 38 and out of line of the right hammer lug 35. The toggle lever 40 is provided with a pair of opposite stop lugs 46 formed inwardly from the opposite edges of said lever 40, which lugs are adapted to contact the yoke pivot screw 33 to limit the angular movement of said lever. The lower end of the lever 40 is provided with an extension arm 47 that is pivotally attached to said lever by a pivot rivet 48 and is capable of being swung outwardly therefrom to the dotted line position as shown in Fig. 2 for reasons which will be described latter.

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The toggle lever 40 is automatically operated to reverse the direction of rotation of the head 10 at predetermined points by a pair of adjustable rings or stops 49 and 50. Specifically these rings are made of spring wire and are located in a pair of corresponding grooves 51 and 52 provided in the outer wall of the threaded nipple 12, and these wire rings are adapted to resiliently embrace that portion of said nipple. Each ring 49 and 50 has a pair of handle extensions 53 and 54 that extend radially outwardly relative to the nipple 12 and are offset relative to each other so that by merely grasping the handle extensions and pressing them together the gripping effect of the rings upon the nipple may be released to permit the rings to be laterally adjusted to any selected position. It will be noted from Fig. 2 that the handle extensions 53 and 54 are positioned so as to be contacted by the extension arm 47 when the latter is in its dependent position.

From Fig. 3 it will be observed that any time the toggle lever 40 is being rotated about its pivot 42, the spring 43 is extended in length to apply a progressively increasing tension upon the yoke ear 45, and as the lever and spring cross a central position the tendency of the spring is to reverse the position of the yoke 32 in the manner of a toggle. To assure that the yoke will not be reversed until a sufficient tension has been built up in the spring 43 to effect a quick reversing action to said yoke 32, I provide a simple escapement incorporated in the lever 40 and yoke 32.

As previously described, the toggle lever 40 is provided with stop lugs 46 that control the amount of rotation of said lever 40. These stop lugs 46 are also adapted to cooperate with a pair of pallet lugs 32a extending outwardly from the lower edge of the yoke 32. From Fig. 3 it will be observed that the relative position of the pallet lugs 32a and the stop lugs 46 is such that during the period that the toggle lever is swinging in a clockwise direction the right pallet lug 32a will glide over the top of the stop lug 46 and hold the yoke 32 against turning until the stop lug 46 has passed the outer edge of said pallet lug 32a. By this time the toggle lever 40 will have substantially completed its swing in a clockwise direction, whereupon the yoke 32 will be snapped by tension spring 43 to its reverse position. Conversely, when the toggle lever is being moved in a counterclockwise direction, as viewed in Fig. 3, the left stop lug 46 will glide over the top surface of the left pallet lug 32a to restrain movement of the yoke 32 until the toggle lever 40 has completed its movement.

Provision is made to provide an effective seal between the tubular spindle 11 and support nipple 12 and also to preload the friction device which resists free rotation of the sprinkler head, and this seal and preload element is incorporated in the support nipple 12 and the tubular spindle 11 connection.

As seen in Fig. 5, the spindle 11 has a threaded portion 55 at its upper end for connection with a tapped hole 56 in the lower end of the sprinkler head 10. A reduced neck 57 extends beyond the threaded portion of the spindle 11 and abuts against the base of the body socket to predetermine the spindle position relative to the body 10. The opposite end of the spindle 11 is provided with an outwardly extending flange 58, and between this flange and the adjacent end of the nipple 12 is positioned a thrust washer 59 of any material having the desired frictional and sealing characteristics. The upper end of the nipple 12 is formed with a recess 60 within which is seated a compression spring 61 bearing against an anti-friction washer 62 located between the body 10 and nipple 12. The washer 59 not only provides an efficient water seal but also under the force of the compression spring 61 and the upward thrust of the water on the sprinkler head, it provides the necessary friction to resist too free rotation of the sprinkler head.

If perchance water should leak or seep into the cham-

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ber provided in the tailpiece 23, the latter is provided with a base opening 63 through which the seepage may constantly drain.

In the operation of the sprinkler when water is directed through the nozzle tip 15 in line with the water deflector vane 20, with the impulse arm in its normal central position, the vane 20 will be deflected to one side or the other, so that the water impinging against one of the inclined surfaces of said vane will cause the impulse arm 17 to swing to one side to the limit that the spring 26 will permit, whereupon the expanding force of the spring 26 upon the arm 17 will cause it to swing in the reverse direction to strike the stop 34 on yoke 32 and impart a slight motion to the sprinkler head 10 in the same direction as the return swing of said arm in a manner well known in sprinklers of this class. If, for instance, the toggle lever 40 is positioned as shown in Fig. 3 that is generally to the left of the center with the left end of the yoke 32 uppermost and with the vane 20 as shown in Fig. 1, that is, with the vane apex to the right of the stream of water issuing from the nozzle tip, the force of the water striking the vane will first force the impulse arm 17 in a clockwise direction as viewed in Fig. 1 and progressively contracting the spring 26 until the force imparted by the water to the impulse arm will have been exhausted, whereupon the spring 26 will force the arm 17 to swing in counterclockwise direction until the left hammer projection 35 on the arm will strike against the left yoke stop 34 and body backing-up lug 36, whereupon the kinetic energy of the returning impulse arm will be imparted to said body and rotate it about its axis a small amount in a counterclockwise direction. Thus the action of the sprinkler head will be continuous until the dependent arm 47 of the toggle lever 40 will contact the handle extension 54 of the lowermost control ring 50 and swing the toggle lever to the right of its position shown in Fig. 3, whereupon the yoke 32 will be swung about its pivot 33 to lower the left stop 34 and raise the right stop 34 in line with the right hammer projection 35 on the impulse arm 17. With the yoke 32 in this position the rotation of the sprinkler head will obviously be in clockwise direction as viewed in Fig. 1.

The range of coverage that this sprinkler is capable of spraying is anywhere from a relatively few degrees up to approximately 350° intermittently operating in reverse direction. If it is desired to operate the sprinkler continuously in one direction it is only necessary to lift the extension arm 47 of the toggle lever 40 to the position shown in dotted outline in Fig. 2, in which position the arm 47 will clear the handle extensions of the adjustable rings 49 and 50.

While the form of sprinkler herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to the precise form of structure shown and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What I claim is:

1. A sprinkler of the intermittent reversible rotary type comprising a support, a sprinkler head rotatably mounted on said support, a discharge nozzle projecting upwardly and laterally from said head, an impulse arm pivoted coaxially on said sprinkler head, a water deflector vane mounted on the end of the arm in line with the stream issuing from said nozzle and serving to swing said arm alternately to opposite sides of said stream, spring means for returning said arm to neutral position in line with said nozzle after each oscillating movement, a yoke pivotally mounted on the side of said sprinkler head on an axis perpendicular to the axis of the head and having stop means projecting therefrom on opposite sides of said head, one of said stop means being located in the path of a portion of said impulse arm when said yoke is in one position while the other of said stop means is out of the path of said arm, and means for moving said yoke at a predetermined point in the rotation of the sprinkler

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head to its opposite position where the position of the respective stop means is reversed to effect a change in the direction of rotation of the sprinkler head, and means on said sprinkler head for directly backing up each of said stop means whereby any impact of said impulse arm against the stop means is transmitted to the head without being absorbed by the mounting of the yoke member.

2. A sprinkler comprising a support, a sprinkler head rotatably mounted on said support, a discharge nozzle projecting upwardly and laterally from said head, an impulse arm pivoted coaxially on said sprinkler head, a water deflector vane pivotally mounted on one end of the arm in line with the stream issuing from said nozzle and serving to impart oscillating movement to said arm, a centering spring serving to return said arm to neutral position in line with said nozzle after each oscillating movement, a yoke pivotally mounted on said head and having stop means disposed on opposite sides of said head, means on said arm for striking said stop means for imparting step-by-step movement to said head about its axis, and means for selectively positioning said stop means one at a time in line with said arm striking means, said sprinkler head being provided with projecting anvil shoulders for backing up said yoke stop means whereby the impulse blows of said arms will be transmitted substantially directly to said sprinkler head.

3. A sprinkler comprising a support, a sprinkler head rotatably mounted on said support, a discharge nozzle projecting from said head, an impulse arm pivoted on said head on the same axis as said sprinkler head upon a spindle which projects upwardly from the sprinkler head, a water deflector vane on one end of the arm in line with the stream issuing from said nozzle and serving to impart oscillating movement to said arm, spring means serving to return said arm to neutral position after it is swung in either direction therefrom by said stream, a pair of striking lugs on the impulse arm, a corresponding pair of anvil shoulders on the sprinkler head, stop means movably mounted on said head having portions positioned against said anvil shoulders, one portion extending upwardly into the path of one of said striking lugs to transmit the impact force of said arm to the head through the adjacent anvil shoulder in one position of the stop means and the other portion acting similarly with the other anvil shoulder in the other position of said stop means, and automatic means for selectively moving said stop means from one of said positions to the other position to reverse the direction of rotation of the sprinkler head.

4. A sprinkler comprising a support, a sprinkler head rotatably mounted on said support, a discharge nozzle projecting upwardly and laterally from said head, an impulse arm pivoted coaxially on said sprinkler head, a water deflector vane pivotally mounted on one end of the arm in line with the stream issuing from said nozzle and serving to impart oscillating movement to said arm, a centering spring serving to return said arm to neutral position in line with said nozzle after each oscillating movement, a yoke pivotally mounted on said head and having stop means disposed on opposite sides of said head, means on said arm for striking said stop means for imparting step-by-step movement to said head about its axis, and means for shifting the position of said yoke about its pivot for selectively positioning said stop means one at a time in line with said arm striking means comprising a toggle lever pivoted to the head in vertical alignment with the pivot of said yoke, a spring forming a connection between points on said yoke and lever which points are offset from the respective pivots of the yoke and lever, which spring is progressively tensioned as said lever is moved to one side or the other from a central position, and means for delaying the shifting of said yoke until said lever has substantially completed its movement to one side or the other comprising outwardly projecting pallet lugs on the yoke and inwardly projecting stop lugs on the lever which glide over the

top of one or the other of said pallet lugs to restrain
said yoke until said stop lugs escape over the pallet lugs.

References Cited in the file of this patent

UNITED STATES PATENTS

1,111,158 Keene ----- Sept. 22, 1914

1,653,160

2,228,720

2,254,270

2,309,782

2,345,030

2,421,551

5

Enright ----- Dec. 20, 1927

Cole ----- Jan. 14, 1941

Coles ----- Sept. 2, 1941

Orr ----- Feb. 2, 1943

Buckner ----- Mar. 28, 1944

Dunham ----- June 3, 1947