Feb. 2, 1943. F. C. ORR 2,309,782

ROTARY SPRINKLER

Filed May 16, 1941 2 Sheets-Sheet 1

Fig. 1

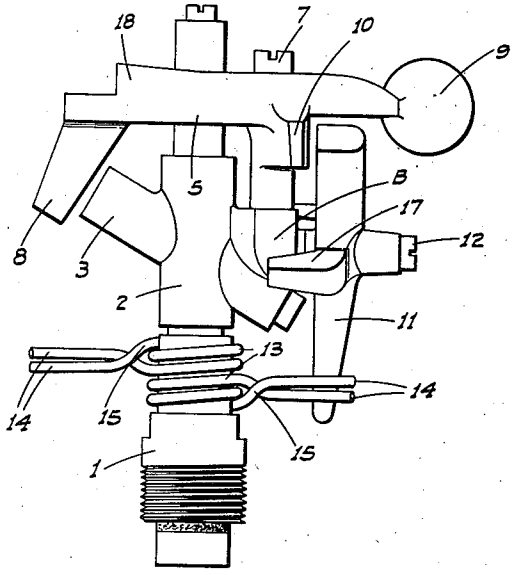


Fig. 2

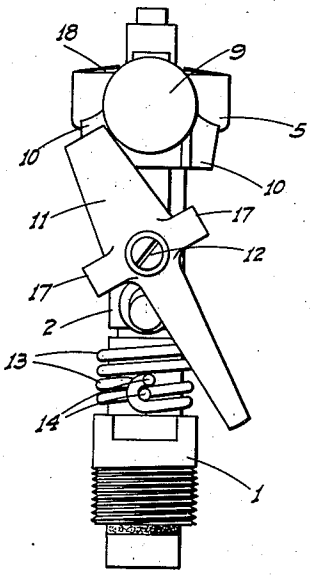


Fig. 3

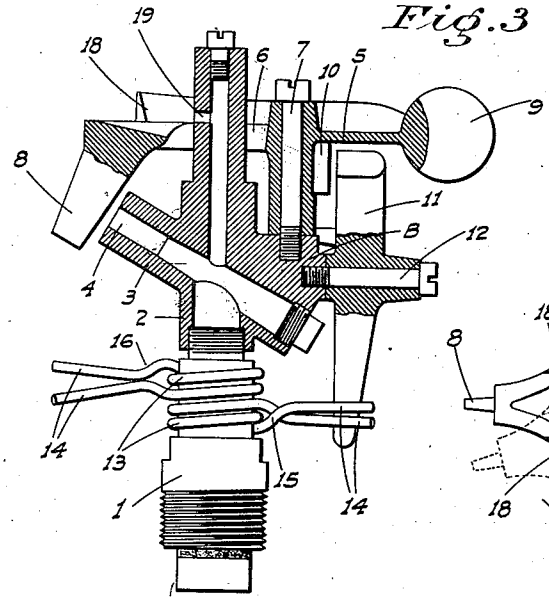
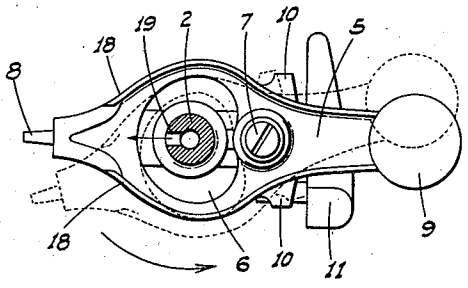


Fig. 4



INVENTOR.
Fingal C. Orr

BY
Orbita & Orbita
ATTORNEYS

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ROTARY SPRINKLER

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Fig. 5

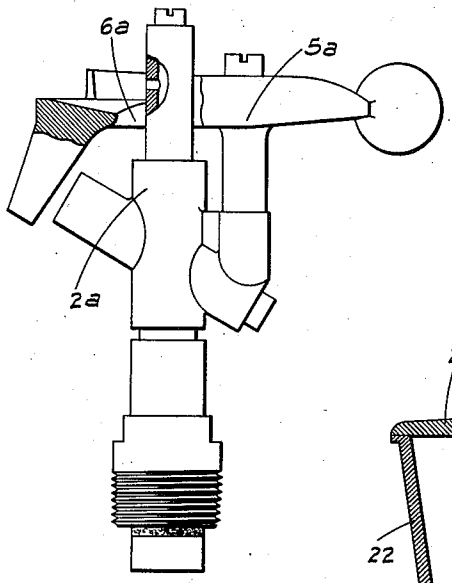


Fig. 8

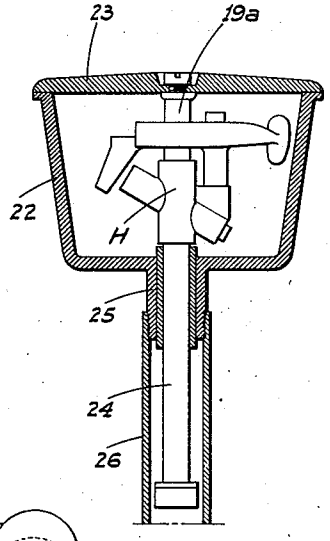


Fig. 6

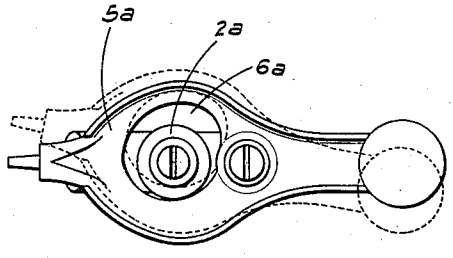
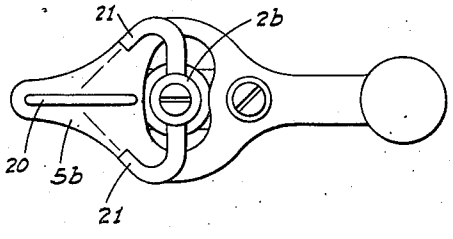


Fig. 7



INVENTOR.
Fingal C. Orr

BY

Webster & Webster

ATTORNEYS

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ROTARY SPRINKLER

Fingal C. Orr, Glendale, Calif.

Application May 16, 1941, Serial No. 393,710

16 Claims. (Cl. 299—69)

This invention relates to rotary sprinklers of the slow motion type in which rotation impulses are intermittently imparted to the rotary sprinkler head by the action of the water issuing from the head against a swinging arm or impulse member mounted on the head. Sprinklers of this general character are shown for instance in my Patent No. 1,710,107, dated April 23, 1929, and in my Patent No. 1,751,879, dated March 25, 1930, the structure of this application being an improvement over the above and similar sprinklers.

One of the major objects of this invention is to provide a means whereby the impulse member will be positively returned towards or to line up with the main stream or jet issuing from the nozzle after each swinging movement away from said stream without the use of weights, springs or the like to accomplish this. A further object is to provide improved means to cause the sprinkler head to rotate in a clockwise or counter-clockwise direction, and to be reversed in its direction of rotation after it has rotated through an arc of predetermined and adjustable extent, and to provide a simple and readily operated means to enable the length of such arc to be altered to suit different conditions of operation. A further object of this invention is to provide a sprinkler having a wide range of coverage and of very compact design as is much to be desired when the sprinkler head is adapted to descend into a receptacle or pot installed with its upper edge approximately level with the ground surface and generally known as the pop-up type of sprinkler.

As a result of my improvements, sprinkler construction is simplified and the cost of manufacture considerably reduced, and there is also less chance for the sprinkler to be damaged by the careless handling to which these devices are frequently subjected, on account of the fact that I use only a few sturdy parts in the sprinkler as a whole.

These objects I accomplish by means of such structure and relative arrangement of parts as will more fully appear by a perusal of the following specification and claims.

In the drawings, similar characters of reference indicate corresponding parts in the several views:

Figure 1 is a side elevation of my improved sprinkler shown as being of the reversing or fractional arc type.

Figure 2 is an end view of the same.

Figure 3 is a sectional elevation of the sprinkler showing one of the stop units untwisted for adjustable rotation.

Figure 4 is a top plan view of the sprinkler, partly in section.

Figure 5 is a side elevation, partly in section, of a sprinkler arranged for continuous rotation in one direction only.

Figure 6 is a top plan view of the same.

Figure 7 is a top plan view of a sprinkler, showing a modified form of impulse member control means.

Figure 8 is an elevation, partly in section, of my invention as applied to a pop-up sprinkler.

Referring now more particularly to the characters of reference on the drawings, and at present to the structure shown in Figs. 1 to 4, the sprinkler generally is of somewhat conventional form, and comprises a main supporting member or base 1 adapted at its lower end for connection to a water supply pipe. Turnably mounted in and upstanding from the member 1 is the sprinkler head 2, said head including a nozzle arm 3 extending radially from the head at an upward acute angle and having a jet opening 4 at its outer end.

A swinging arm or impulse member is supported from the head above the nozzle, said member including a horizontal plate 5 having an opening 6 surrounding the upper end of the head 2 in free clearance relation. The plate is pivotally supported from the head for swinging movement in a horizontal plane by means of a stem 7 parallel to the axis of the head and mounted on the side thereof opposite nozzle 3. The plate at one end overhangs the nozzle and at said end has a water engaging vane 8 depending across the path of the jet issuing from the nozzle. At its opposite end, the plate 5 is formed with a weight 9. Said plate is also formed with laterally opposed abutments or lugs 10 on opposite sides of the pivot pin 7 and between said pin and the weight, said lugs depending some distance below the plate. Disposed below the plate in a plane between the lugs and weight is a vertically disposed arm 11, weighted at its upper end so as to be topheavy and pivoted intermediate its ends on the head 2 on a horizontal pin 12 radial with said head.

Helical constriction coils 13 are turnably mounted in superposed relation on the base 1 immediately below the head, said coils each terminating in straight extensions 14 projecting radially from the coils and formed adjacent their junction with the turns of the coils with relatively abrupt bends adapted to be twisted into disengageable locking relation with each other by a half turn movement as indicated at 15. When the extensions are so twisted, they are substantially parallel to each other, and the corresponding coil then constricts on the body so that it cannot turn thereon. When, however, the extensions are untwisted as indicated at 16 in Fig. 3, the constrictive grip of the coil on the base is released and the coil can be turned at will. The extensions of each coil together form a stop unit

depending into the path of rotation of the lower end of the arm 11, and it will of course be understood that each coil and its extensions are independent of the other.

As stated, the arm 11 is topheavy, and its movement in one direction or the other is limited by the engagement of one or the other of a pair of side lugs 17 of said arm with the mounting boss B of the pins 7 and 12 on one side or the other. When the upper portion of said arm is swung to one side, it is in position to be engaged by the lug 10 of the impulse member on the same side, upon a relatively short arcuate swinging movement of the impulse plate 5 in a corresponding direction from the normal center line position. The thrust thus given to the arm through the lug 10 imparts a rotative movement to the head as a whole, as will be evident, due to the offset mounting of the impulse member and arm relative to the axis of the head. When the head has rotated sufficiently to bring the lower end of the arm 11 into engagement with an adjustable stop unit 14, said arm swings or trips across to its opposite position, placing its upper end in the path of the other lug 10 and causing a reversal in the direction of rotation of the sprinkler head.

The swinging of the impulse member or plate 5 which causes the above described recurring rotative impulses to be imparted to the head, is caused by the suction and repulsion action of the water jet issuing from the nozzle 3 acting in conjunction with the deflector vane 8, in a manner somewhat similar to and governed by the same natural laws as are taken advantage of to bring about the movement of the swinging arm or impulse member as disclosed in my aforementioned Patent No. 1,710,107. The action of the water jet on the vane 8 swings the plate 5 to one side or the other and out of the jet. In order to assure the return of said plate to or toward the center line position after each swing as is necessary to assure a steady and constant intermittent rotation of the head, I provide the following means:

Upstanding from the plate 5 on opposite sides are flanges 18 which converge toward each other in the direction of the vane and of the plate in symmetrical relation to said vane, and terminate in spaced relation to each other adjacent the vane end of the plate.

The head 2 is provided with a relatively small horizontal jet opening 19 facing in the same direction as nozzle 3 and disposed on a level directly above the plate 5 so that the jet issuing from opening 19 is in the path of the flange 18 and will impinge against one or the other of the same when the impulse member swings out of the main center line position. When the member is in the said aforementioned position, the space or opening between the flanges 18 is in line with the jet from opening 19 so that the water then discharges in the clear. By reason of this auxiliary jet and flange arrangement, therefore, it will be seen that as the impulse member is swung to one side by water acting on the vane 8 from the main nozzle, one flange 18 is moved in front of the jet issuing from opening 19. Said flange will then be at an angle to the jet so that the pressure exerted thereby against the flange will cause the impulse member to be positively swung back to be in position to be again acted on or swung by the main jet.

In Figs. 5 or 6, the construction of the sprinkler head and impulse member are generally the same as above described. However, the reverse-movement control arm 11 and the stops for the same are omitted; the sprinkler head 2*a* being intended for continuous rotation in one direction only.

In order to thus impart such rotation to the head, the opening 6*a* in the impulse plate 5*a* is disposed in eccentric or off-center relation in the plate. By reason of this arrangement, the plate at one side of the opening will contact the upper portion of the head 2*a* with a relatively small swinging movement of the plate from the main center line position as indicated in the dotted lines in Fig. 6. Also, as will be evident, a much greater and never attained swinging movement of the plate would be necessary for the contact of said plate at the opposite side of the opening 6*a* with the head. Continuously recurring rotative impulses are therefore imparted to the head in one direction only with the swinging of the impulse plate; the latter being brought back to center each time by the same flange and auxiliary water jet as previously described.

In Fig. 7, I have shown a modified means to return the impulse plate to the center line position. In this form of the device, the flanges 18 are omitted from the impulse plate 5*b* and a single centrally disposed upstanding fin or flange 20 is mounted thereon between the sprinkler head 2*b* and the vane end of the plate. A pair of relatively small nozzles 21 are mounted on and project laterally from the head 2*b* above the plate 5*b* on opposite sides, said nozzles being bent so as to discharge water evenly against the opposite sides of the fin at an angle thereto. The action of these opposed jets against the fin therefore acts to maintain the plate in its normal central position.

With any form of the impulse plate return means as above described, the use of springs or the like is avoided, and there is nothing to get out of order or give trouble. Also, the use of the specific type of adjustable stop units eliminates the need of set screws and the like which have heretofore been considered necessary in making positive locked stop adjustments.

In Fig. 8, the sprinkler structure as shown is obviously the same as that the sprinkler illustrated in Fig. 6. The sprinkler head H is normally disposed in a cup 22 countersunk in the ground and having a lid 23 loosely supported on top of the upstanding auxiliary jet member 19*a* of the sprinkler head for vertical movement therewith.

As usual in sprinklers of the type herein disclosed, the depending spindle 24 of the sprinkler head slides and turns in a bushed boss 25 depending from the cup and on which the water supply pipe 26 is secured.

From the foregoing description it will be readily seen that I have produced such a device as substantially fulfills the objects of the invention as set forth herein.

While this specification sets forth in detail the present and preferred construction of the device, still in practice such deviations from such detail may be resorted to as do not form a departure from the spirit of the invention, as defined by the appended claims.

Having thus described my invention, what I claim as new and useful and desire to secure by Letters Patent is:

1. A rotary sprinkler comprising a sprinkler head mounted for rotation and having a radial nozzle for projecting a water jet, an impulse member normally extending lengthwise of the

nozzle, means pivoting the member on the head for swinging movement, a water engaging element mounted on the member in position to project into the path of the jet when said member is in a normal position so that the jet will cause the member to swing from such position, means to impart a rotative thrust to the head with each complete swinging cycle or movement of the member, and water jet actuated means to return the member to said normal position after it has been swung.

2. A structure as in claim 1 in which said last named means comprises a flange on and projecting from the member substantially at right angles to the plane of movement thereof, and means providing an auxiliary water jet from the head directed toward the flange on the side thereof toward which the member moves when swung.

3. A rotary sprinkler comprising a sprinkler head mounted for rotation and having a radial nozzle for projecting a water jet, an impulse member normally extending lengthwise of the nozzle, means pivoting the member on the head for swinging movement in a predetermined plane, a water engaging element mounted on the member and projecting into the path of the stream issuing from the nozzle when said element is in a normal position to cause the member to swing to one side from said normal position, means between the member and head to impart a rotative impulse to the head with each such swing of the member, and a substantially vertical longitudinally extending surface on the member, the sprinkler head having an auxiliary jet directed toward said surface at an angle thereto to cause the water from the jet to impinge against the surface on the side thereof toward which the member swings away from said normal position.

4. A rotary sprinkler comprising a sprinkler head mounted for rotation and having a radial nozzle for projecting a water jet, an impulse member normally extending lengthwise of the nozzle, means pivoting the member on the head for swinging movement, a water engaging element mounted on the member in position to project into the path of the jet when said member is in a normal position so that the jet will cause the member to swing from such position, means between the member and head to impart a rotative thrust to the head with each complete swinging movement of the member, and water jet actuated means to return the member to said normal position after it has been swung.

5. A structure as in claim 4 in which said last named means comprises a flange on and projecting from the member substantially at right angles to the plane of movement thereof, and means providing an auxiliary water jet from the head directed toward the flange on the side thereof toward which the member moves when swung.

6. A rotary sprinkler comprising a sprinkler head mounted for rotation and having a radial nozzle for projecting a water jet, an impulse member normally extending lengthwise of the nozzle, means pivoting the member on the head for swinging movement, a vertical water engaging element mounted on the member and projecting into the path of the stream issuing from the nozzle when the element is in a normal position to cause the member to swing to one side from said normal position, means between the member and head to impart a rotative impulse to the head with each such swing of the member, a substantially vertical surface on the member, the sprinkler head having an auxiliary jet directed toward said surface at an angle thereto to cause water from the jet to impinge against the surface on the side thereof toward which the member swings away from said normal position.

7. A rotary sprinkler comprising a sprinkler head mounted for rotation and having a radial nozzle for projecting a water jet, an impulse member normally extending lengthwise of the nozzle, means pivoting the member on the head for swinging movement in a predetermined plane, a vertical water engaging element mounted on the member and projecting into the path of the stream issuing from the nozzle when the element is in a normal position to cause the member to swing to one side from said normal position, means between the member and head to impart a rotative impulse to the head with each complete swinging cycle of the member, a substantially vertical surface on the member extending lengthwise thereof, and auxiliary nozzles on the head positioned to direct jets of water against the flange on opposite sides and at an acute angle thereto.

8. A rotary sprinkler comprising a sprinkler head mounted for rotation and having a radial nozzle for projecting a water jet, an impulse member normally extending lengthwise of the nozzle, means pivoting the member on the head for swinging movement in a predetermined plane, a substantially vertical water engaging element mounted on the member and projecting into the path of the stream issuing from the nozzle when the element is in a normal position to cause the member to swing to one side or the other from said normal position, means between the member and head to impart a rotative impulse to the head with each swinging cycle of the member, and spaced side flanges upstanding from the member and converging toward each other in a direction away from the head to a spaced termination; the head having an auxiliary jet opening disposed to direct a water jet centrally between the flanges when the member is in a normal central position, and positioned on a level such as to cause the jet issuing from said opening to impinge against one or the other of said flanges when the member swings to either side of the normal center line position.

9. A rotary sprinkler comprising a sprinkler head mounted for rotation and having a radial nozzle for projecting a water jet, an impulse member normally extending lengthwise of the nozzle, means pivoting the member on the head for swinging movement, a water engaging element mounted on the member in position to project into the path of the jet when said member is in a normal position so that the jet will cause the member to swing in one direction from such position, means between the member and head to impart a rotative impulse to the head with each such swinging movement of the member, water jet operated means to return the member to a normal position, means between the member and head to rotate the latter in one direction upon swinging of the member in one direction, and means functioning automatically after and operated by rotation of the head in said one direction through a predetermined arc to cause the member to be swung by the nozzle stream in the opposite direction and to cause the

head to be then rotated through the same arc in said opposite direction.

10. In a rotary sprinkler, the combination of a sprinkler head having a nozzle for projecting a water jet, means for supporting the sprinkler head to rotate about an axis, an impulse member mounted to swing on the sprinkler head and having a deflector capable of moving into the said jet so that the jet will cause the impulse member to swing on its axis and out of the jet, auxiliary water jet means for urging the impulse member in a direction to return the deflector into the jet, means cooperating with the impulse member to cause a step-by-step rotation of the sprinkler-head in one direction, and means operating after the sprinkler-head has moved through a predetermined arc to effect a step-by-step rotation of the sprinkler head in the reverse direction.

11. A structure as in claim 10 in which said last named means includes elements arranged for separate adjustment about the head to enable the extent of said arc to be altered at will; said last named means including a vertical top-heavy arm pivoted on the head for limited swinging movement to one side or the other of the perpendicular and whose swung position on one side or the other determines the direction of rotation of the head and circumferentially spaced adjustable stop elements projecting radially from the head supporting means to engage and cause the arm to reverse itself in position after a predetermined arcuate movement of the head in one direction.

12. A structure as in claim 10 in which said last named means includes elements arranged for separate adjustment about the head to enable the extent of said arc to be altered at will; said last named means including a vertical top-heavy arm pivoted on the head for limited swinging movement to one side or the other of the perpendicular and whose swung position on one side or the other determines the direction of rotation of the head and circumferentially spaced adjustable stop elements projecting radially from the head supporting means to engage and cause the arm to reverse itself in position after a predetermined arcuate movement of the head in one direction, each stop element comprising a helical spring coil turnably mounted on the head supporting means at a level above the lower end of the arm, and extensions projecting substantially radially of the coil from the terminals thereof; said extensions adjacent their junction with the coil being formed with cooperating bends adapted to be engaged in releasable locked relation with each other upon relative twisting of the extensions and to then cause the coil to be clamped about the supporting means.

13. In a sprinkler of the fractional arc or self-reversing type having a base about which the sprinkler rotates, and reverse controlling mechanism including a depending arm on the sprinkler movable in a substantially vertical direction to effect such reversal; adjustable stops mounted on the base between which the arm depends, each stop comprising a helical constricting coil turnable on the sleeve and having radially extending ends disposed in twistable relation to each other and adapted so that a partial twist of one end over the other will cause the coil to constrict on the base in locked but releasable relation thereto.

14. A rotary sprinkler comprising a sprinkler head mounted for rotation and having a radial nozzle for projecting a water jet, an impulse member normally extending lengthwise of the nozzle, means pivoting the member on the head beyond the axis thereof on the side opposite the nozzle for swinging movement in a horizontal plane above the nozzle and projecting beyond the head, a depending element on the member positioned for movement into the jet so that the latter will cause the impulse member to swing to one side or the other of its normal central position, water jet actuated means on the member to return the same to said normal position, a top-heavy arm disposed below the member on the opposite side of the head from the nozzle and beyond the axis of the member, a horizontal pivot for the arm, means limiting the swing of the arm to one side or the other of a perpendicular position, laterally spaced lugs on the member disposed in spaced relation thereto between said arm and the axis of the member whereby the lug on one side of the member when the latter is swung to one side is in position to abut against the upper end of the arm when the latter is swung to the corresponding side and means functioning upon rotation of the head through a predetermined arc to cause the arm to be reversed in position whereby to dispose its upper end in position for engagement with the other lug on the member when said member is correspondingly swung.

15. A rotary sprinkler comprising a sprinkler head mounted for rotation and having a radial nozzle for projecting a water jet, an impulse member normally extending lengthwise of the nozzle, means pivoting the member on the head beyond the axis thereof on the side opposite the nozzle for swinging movement in a plane above the nozzle, a depending element on the member positioned for movement into the jet so that the latter will cause the impulse member to swing to one side or the other of its normal central position, means acting on the member to return the same to said normal position; the member having an opening through which the head above the nozzle projects; said opening having means associated therewith to cause the member to be arrested in its swing relative to the head when traveling in one direction at a lesser distance beyond the nozzle opening than when swinging in the opposite direction whereby to impart a rotative thrust to the head with each complete swinging cycle of the member.

16. A sprinkler of the fractional arc reversing type having a reversing means which includes a depending finger engageable with adjustable stop members adapted to be selectively spaced at different distances apart to determine the desired arc of movement of the sprinkler head, each such stop member consisting of a constricting coil surrounding the base about which the sprinkler rotates, such coil having radially extending ends disposed in twistable relation to each other and adapted so that a partial twist of one end over the other will cause the coil to constrict on the base in locked but releasable relation thereto.

FINGAL C. ORR.