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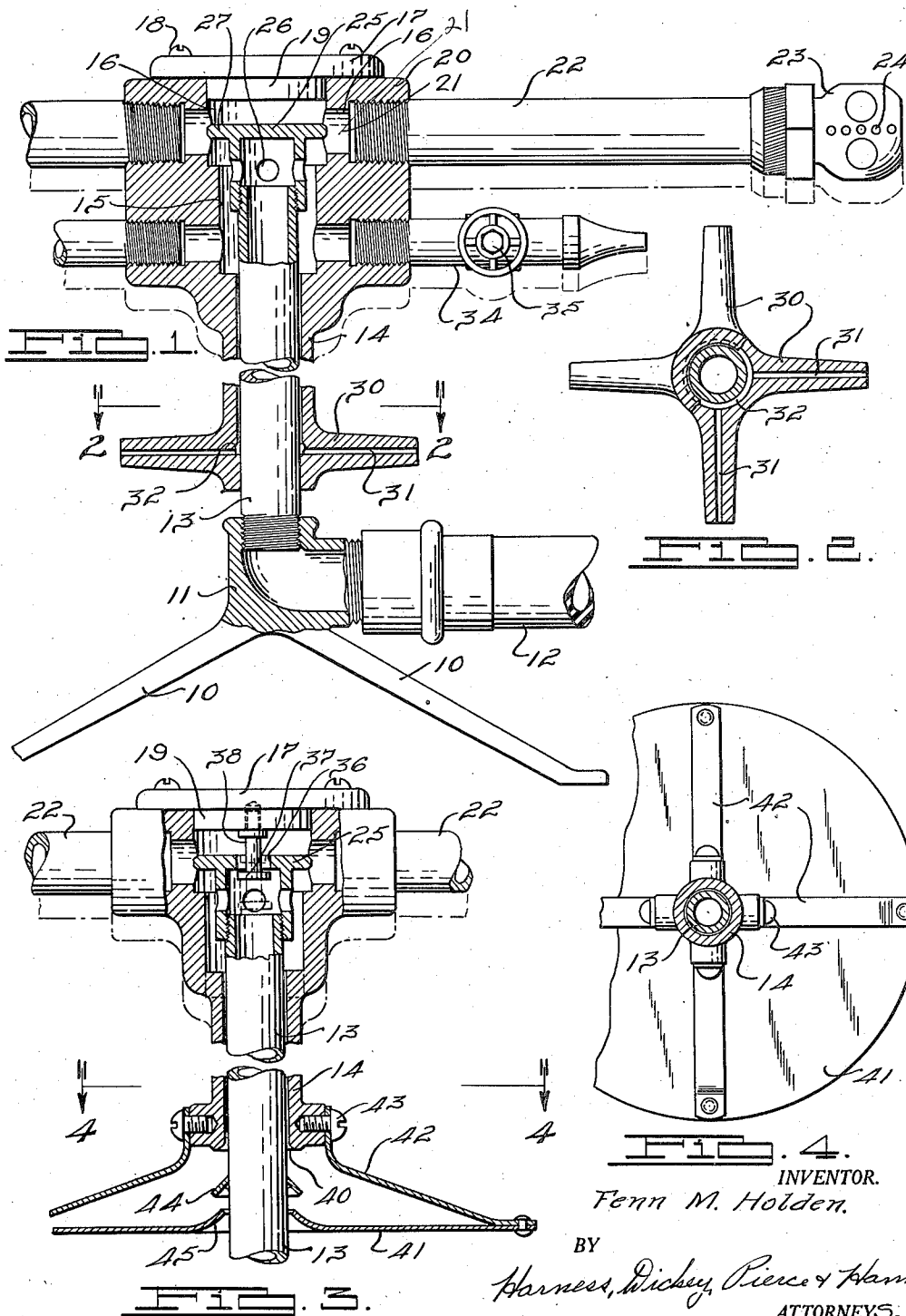
F. M. HOLDEN

2,066,531

SPRINKLER

Filed March 23, 1934

2 Sheets-Sheet 1



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BY

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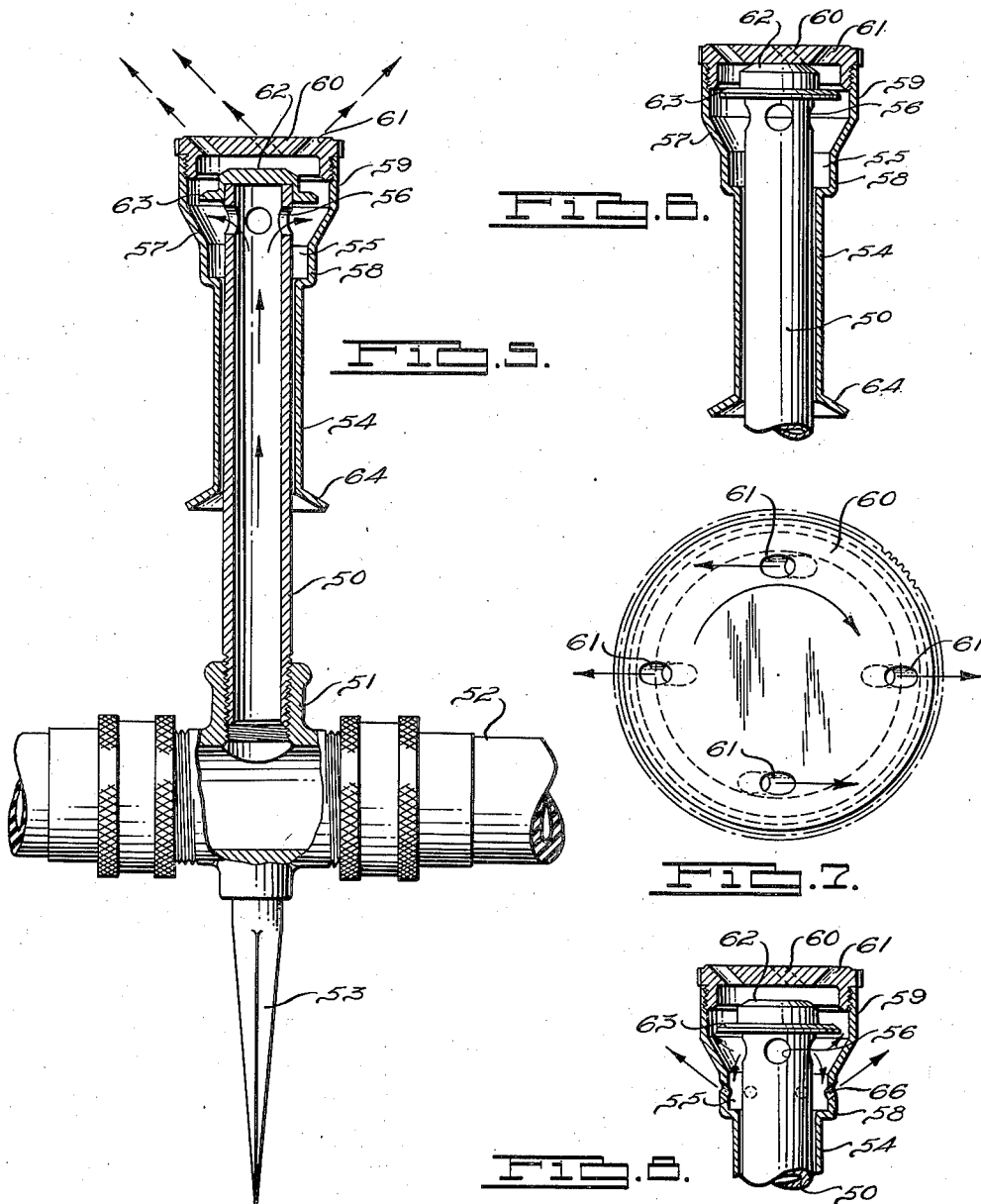
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UNITED STATES PATENT OFFICE

2,066,531

SPRINKLER

Fenn M. Holden, Pontiac, Mich.

Application March 23, 1934, Serial No. 716,975

17 Claims. (Cl. 299—69)

The invention relates to lawn sprinklers and has particular relation to sprinklers having fluid actuated, rotary nozzles.

While sprinklers of the fluid actuated, rotary type are in general use, several unsatisfactory factors enter into the construction and operation of at least the ordinary types. One of the factors is that thrust bearing surfaces are utilized, and this not only adds to the cost of manufacture but decreases the durability of the structure. Again, when relatively rotary or slidable parts are employed, packing has ordinarily been provided for preventing leakage of water and this increases the frictional resistance to movement of said parts and furthermore it is not durable and must be replaced or adjusted at intervals. Additionally, the sprays or streams of water thrown by the sprinklers frequently do not uniformly cover the area intended to be watered owing to the arrangement and operation of the sprinkler nozzles, from which it follows that one portion of the lawn is watered more than another, and this condition is not desirable.

One of the objects of the present invention is to provide a sprinkler of the rotary type which will throw sprays or streams of water in a more uniform manner over the area of lawn intended to be watered.

Another object of the present invention is to provide a sprinkler of the rotary nozzle type wherein the usual thrust bearings are eliminated, thereby providing a construction which has greater durability and which is less expensive to manufacture.

Another object of the invention is to provide a sprinkler which reduces wear to a minimum between relatively rotatable and slidable parts in a sprinkler of the fluid actuated rotary type.

Another object of the invention is to provide a sprinkler of the fluid actuated rotary type which eliminates the undesirable effects of leakage of water between relatively rotatable or slidable parts.

Another object of the invention is to provide a sprinkler of the fluid actuated rotary type wherein any leaking water is efficiently sprinkled over the lawn around the sprinkler so as to provide, in effect, an active, auxiliary sprinkler system.

Another object of the invention is to provide a sprinkler of the fluid actuated rotary type wherein the water acts as a thrust bearing between relatively rotatable parts.

Another object of the invention is to provide a sprinkler of the rotary type wherein certain outlets may play stream or spray on the lawn at a

pressure below the line pressure in the water supply line and wherein other nozzles may play a stream or spray on the lawn at a pressure substantially corresponding to the pressure in the water supply line.

Other objects of the invention will become apparent from the drawings, the specification relating thereto, and from the claims hereinafter set forth.

For a better understanding of the invention, reference may be had to the drawings, wherein:

Figure 1 is a vertical, cross-sectional view of a sprinkler constructed according to one form of the invention.

Fig. 2 is a cross-sectional view taken substantially along the line 2—2 of Fig. 1.

Fig. 3 is a view similar to Fig. 1 illustrating another form of the invention.

Fig. 4 is a cross-sectional view taken substantially along the line 4—4 of Fig. 3.

Fig. 5 is an elevational view, largely in cross-section, of a sprinkler constructed according to another form of the invention.

Fig. 6 is a fragmentary view of the sprinkler shown by Fig. 5, illustrating the relation of parts when the water in the supply line is turned off.

Fig. 7 is a plan view on a larger scale of the structure shown by Fig. 6.

Fig. 8 is a fragmentary view of the sprinkler shown by Fig. 5, provided with a lower set of outlet openings.

Referring to Fig. 1, the base of the sprinkler is indicated at 10 and this base may be in the form of a tripod or other form of support, as will be readily understood. The base may have an elbow 11 threadedly connected at one end to a water supply line or hose 12 and at its opposite end to a vertically extending pipe 13 threaded into the opposite end of the elbow. A tubular casting or housing 14 is slidably arranged on the pipe 13 and adjacent the upper end of the latter has an enlarged chamber 15 and a still larger chamber 16 above the latter, which is closed at its upper end by a cap plate 17. The latter is secured to the casting by machine screws 18 and has a plug portion 19 partially projecting into the chamber 16. A plurality of bosses 20 having openings 21 communicating with the chamber 16 project radially from the upper end of the casting and each of the bosses has a pipe 22 threaded thereto. The outer end of each pipe may be provided with a nozzle 23 having a series of openings 24 at one side from which the water may be thrown tangentially and while the nozzle shown is only illustrative and

various other forms may be employed, it will be readily appreciated that water forced from the openings will cause the sprinkler to rotate. In the construction shown four of the pipes may be used, and these pipes may be arranged in 90° spaced relation.

The upper end of the pipe 13 is threaded into an inverted cup having a solid end wall 25 and a side wall provided with a plurality of openings 26 through which water from the pipe may flow into the chambers 15 and 16. The end wall 25 has a radially projecting rim 27 that may substantially correspond to the diameter of the chamber 16 although a loose fit is satisfactory.

When water flows through the pipe 13, the movement of the casting 14 will depend on several factors. The weight of the casting and the pressure of the water on the shoulders at the lower ends of chambers 15 and 16 will tend to move the casting downwardly, whereas the pressure of the water against the plug 19 will tend to move it upwardly. While slight friction may resist movement of the casting, normally this is negligible. When the opposing forces are equal, the casting will be in a position of equilibrium and while this position may vary during operation, depending on water pressure conditions, the casting will be held in an intermediate position where it is supported by and rotates on a body of water.

While frictional resistance to water flow, centrifugal force and perhaps other factors may be present, the pressure of the water in pipes 22 substantially may be determined according to the following formula: $P_1A_1 = P_2A_2 + W$ wherein P is the pressure in pipes 22 and chamber 16, A_1 the area of the lower face of plug 19, P_2 the line pressure in pipe 12 and chamber 15, A_2 the area of the shoulders at the lower ends of chambers 15 and 16, and W the weight of the casting 14.

With the parts arranged as shown and without the water being turned on, the weight of the casting naturally will cause it to drop until the plug portion 19 rests on the end wall 25 of the cap. When the water is turned on, it flows upwardly into the pipe 13 and laterally through the openings 26 into the chambers 15 and 16 and at the same time it flows radially into the pipes 22. As the water flows from the openings 26 into the chamber 16 and the pipes 22 below the end wall 25, sufficient water also will creep between the edge of the rim 27 and the side wall of the chamber 16 so as to flow between the plug 19 and the end wall 25 and exert an upward pressure against the plug portion, and this will cause the casting 14 to move vertically with respect to the pipe 13. This action occurs quickly when the water is turned on, and as the casting 14 moves upwardly, the rim 27 gradually restricts the openings 26 leading to the pipes 22. As these openings become restricted, the pressure of the water above the end wall 25 and in the pipes 22 will decrease and it follows that the upward pressure of the water on the plug portion 19 will decrease and the force which tends to elevate the casting will become smaller. This restriction of the openings and reduction of water pressure in the pipes 22 and above the end wall 25 continues until the weight of the casting 14 plus the force acting against the shoulders at the lower ends of chambers 15 and 16 balances the force of the water acting to move the casting 14 upwardly and then a state of equilibrium will exist.

If the line pressure of the water decreases, an

instant drop in pressure of the water acting against the plug 19 will occur and the casting will move downwardly and this results in the rim 27 uncovering more of the openings 16. This in turn reduces the pressure drop of the water as it flows through the openings 16. The final result seems to be that the pressure of the water in the pipes 22 and above the end wall 25 will be a substantially constant percentage of the line pressure although as the pressure decreases the weight of the casting will become more of a factor in the formula previously set forth and will cause more of a variation in the percentage.

It will be appreciated that during normal operation the casting 14 is rotating on a body of water and that the only metal parts that might contact are those along the periphery of the pipe 13 and rim 27. End thrust metal bearings are thus eliminated and this is very advantageous because the parts subject to the greatest wear in a sprinkler of this type manufactured previously are those taking end thrust. Even along the surface of the pipe 13 the downwardly flowing or leaking water will efficiently serve as a water bearing to avoid wear of the housing and pipe so that all relative movable parts of the sprinkler will have a water bearing between them.

Some leakage of water can occur downwardly between the casting 14 and the pipe 13 as a tight fit is not desirable for the reason that the parts should rotate freely relative to one another and in order to prevent this leaking water from dropping under the sprinkler and not being used effectively, the lower end of the casting may be provided with four radial projections 30 that have openings 31 extending to the space around the pipe 13. The inner ends of these openings communicate with an annular passage 32 and when water flows downwardly along the pipe, it flows into the annular passage 32 and since the water is constantly being subjected to centrifugal force, it is urged radially into the openings 31 and from these openings it is ejected in the form of a stream that plays for a short distance away from the axis of rotation of the sprinkler. Practically no water would leak past the openings 31 along the pipe 13 because the water as soon as it reaches the annular passage 32 immediately is drawn radially into the openings 31. This construction avoids the use of packing and enables obtaining a greater freedom of relative rotation between the casting and the pipe, and furthermore simplifies manufacturing the sprinkler because tight fitting assemblies are not necessary.

It may be desirable in a sprinkler of this character also to have shorter pipes communicating with the lower part of the chamber 15 as indicated at 34, and these are connected to the casting in such manner that they communicate with the chamber 15. The water that flows through these pipes will have substantially line pressure and hence will play more powerful streams of water over the lawn. While various forms of nozzles may be used on the outer ends of the pipes 34, it may be preferable to use straight nozzles so that the water will be thrown radially from the end of the pipes over much greater distances and so that the water thrown from the pipes 22 will control rotation of the sprinkler. Any number of the pipes 34 may be used and they may be located in vertical alignment with the pipes 22 or in intermediate positions as found most desirable. The pipes 34 may or may not be provided, and if provided, they may be closed whenever desired by using suitable valves indicated at 35. Thus, the

user may at his option have a combination sprinkler or a sprinkler wherein the pipes 22 only will be utilized.

The construction shown by Fig. 3 is similar to that shown by Fig. 1 excepting that the end wall 25 has a central opening 36 adapted to receive a valve head 37 which is mounted on a stem 38 rigidly connected to the cap 17. In this construction when the water is turned off, the end wall 25 is resting against the plug portion 19, but the opening 36 is clear so that water may flow there-through and upwardly against the plug portion 19 so as to immediately raise the casting. It was mentioned in connection with Fig. 1 that when the end wall 25 rested against the plug 19, water initially flowing through the pipe 13 would creep around the edge of the rim 27 and in between the plug 19 and end wall and force the casting upwardly as the rim would have a loose fit which readily permitted this water to creep around its edge. The same construction may be used in Fig. 3, although it may be preferable to employ the opening 36 and valve head 37 so that the water flows immediately through the end wall. As the casting raises, the valve head 37 approaches the end wall 25 and gradually restricts the opening 36 thus increasing the drop in pressure and finally will close it substantially when the casting is raised a sufficient amount to cause the valve head 37 to move into the opening. It is also practical to use an opening in the end wall 25 without using the valve, but this opening should be small enough so as to not substantially interfere with the pressure drops effected by controlling the size of the openings 16. This construction also may be provided with the pipes 34 as will be readily understood.

For dissipating any leaking water that may occur a slightly different arrangement is shown in Fig. 3 as compared to that shown in Fig. 1. In this construction any water leaking between the pipe and casting reaches a flared opening 40 at the lower end of the casting and owing to centrifugal force is thrown outwardly along the sides of this opening and upon a disk 41 where it is thrown radially beyond the periphery of the disk by centrifugal force. The disk may be supported by a plurality of straps 42 connected by screws 43 to the lower end of the casting and riveted to the outer edge of the disk. To positively prevent any water from flowing along the pipe and below the disk, a water shed 44 is tightly fixed on the pipe below the opening 40 and is of conical shape so that any water reaching it will drip downwardly or be thrown laterally upon the disk 41. The central portion of the disk may be upwardly flared, as indicated at 45, to further prevent any water from leaking even past the shed 44 along the pipe 13.

In the construction shown by Fig. 5, a pipe 50 is provided and while this pipe may be connected to a water supply line, such as shown by the previous figures, it is shown as being threaded into a joint 51 provided in the length of a hose 52. Also, if desired, the joint 51 may have an anchoring element 53 by means of which it may be pressed into the ground to hold the pipe 50 in an upright position.

At its upper end the pipe 50 projects into a tubular shell or housing 54 which is enlarged at its upper end to provide a chamber 55, and for allowing water from the pipe 50 to enter this chamber the pipe has circumferentially spaced openings 56. The chamber is partially at least defined by a conical wall 57 and a cylindrical wall

58 and while a horizontal shoulder might be provided in place of the conical wall, the conical wall is preferred as it facilitates manufacturing the tubular element 54 from sheet metal by means of metal drawing operations. Above the conical wall 57, the tubular element 54 has a cylindrical wall 59 which is closed at its upper end by a screw cap 60 which has a plurality of angled openings indicated at 61. These openings may be arranged in different ways but in the construction illustrated and as best shown by Fig. 7, two of the openings are arranged in diametrically opposed relation to each other and are disposed in radial planes while two openings also arranged in diametrically opposed relation and between the first pair of openings are tangentially directed so that water flowing therethrough will tend to rotate the tubular element.

The upper end of the pipe 50 and above the openings 56, has a cap 62 mounted thereon in a fixed manner such as by soldering, welding or screw-threading it on the pipe, and this cap has a rim 63 which is adapted to cooperate with the conical wall 57 so as to variably restrict the opening through which water may flow to a point above the cap, depending upon the relative positions of the pipe and tubular element. At its lower end, the tubular element 54 is flared outwardly as indicated at 64 so that any water leaking downwardly between the tubular element and pipe will be directed into the flared opening and along the flared portion 64 and be centrifugally thrown around the sprinkler in a spray form.

Initially with the water turned off, the tubular element 54 is in its lower position with the cap 60 resting on the cap 62 as shown in Fig. 6, and when the water is turned on it immediately flows through the pipe 50, openings 56, around the rim 63 and upwardly against the cap 60 and through the openings 61. Water flowing through the tangentially arranged openings in the cap 60 will cause the element 54 to rotate and simultaneously the tubular element will be raised owing to the pressure of the water on the cap. In this construction, the weight of the tubular element plus the force of the water acting on the conical portion 57 and the shoulder below this cylindrical portion 58 will tend to move the element downwardly while the pressure on the water against the cap 60 will tend to move the tubular element upwardly. As soon as the water is turned on, the element will be moved upwardly owing to the fact that the force against the cap 60 is greater, but as the element moves upwardly the rim 63 on the cap 62 begins to restrict the opening along the conical portion 57 thereby causing a greater drop in pressure through the opening so that the force tending to elevate the tubular element becomes smaller. Finally a balanced condition will prevail where the tubular element will rotate and float on a water bearing similarly to the manner in which the previous constructions operate. Substantially the same formula previously set forth will apply in this construction insofar as determining the pressure of the water thrown from the openings 61.

If desired, this type of sprinkler may be provided with openings 66 in the side wall 58 below the conical portion 57, as shown in Fig. 8, so as to allow water to be thrown from the sprinkler at substantially line pressure. These openings thus provide an auxiliary sprinkling system for throwing longer streams of water around the sprinkler and such openings may be located in alternating

relation to the openings 61 or in variable arrangements as may be found desirable.

This construction is extremely simple and inexpensive to manufacture as the tubular element 54 may be constructed from sheet metal by drawing operations well understood in the art and the construction of the caps 62 and 60 is very inexpensive. Sprinklers of this character throw streams of water in well balanced relation and as will be evident by Fig. 7, if the two different types of openings are employed in the cap 60, the radial streams and tangential streams will cover different areas. Furthermore, if the construction shown in Fig. 8 is employed, longer jets of water will be thrown around the sprinkler as the pressure of the water in the openings 66 will be greater thereby providing an arrangement which will efficiently and uniformly cover a large area. In addition to this, the dissipation of leaking water from the flared openings at the lower end of the tubular element 54 will efficiently cover the area more closely adjacent to the sprinkler.

In any of the constructions illustrated, it will be appreciated that assembly and disassembly of the parts may be readily accomplished by removing the upper cap and then removing the cap on the upper end of the pipe.

Thus the parts are readily accessible if it should ever be necessary to clean the sprinkler or make any replacements or repairs. Furthermore, all of the sprinklers are practically free from parts that might wear out, as metal-to-metal friction is practically eliminated, and this greatly increases the durability of the construction. The invention also enables an effective dissipation of any leaking water and through this, renders it unnecessary to use the ordinary packing that is not durable and which increases the resistance to rotary movement of the sprinkler casting. Provision of the water bearing not only eliminates thrust bearings but provides a greater freedom of rotation so that the sprinkler will easily turn during its operation.

Although more than one form of the invention has been illustrated and described in detail, it will be apparent to those skilled in the art that various modifications may be made without departing from the spirit of the appended claims.

What I claim is:

1. A sprinkler comprising a tubular element, a hollow member having sprinkler outlets and a projecting tubular portion rotatably mounted on the element, means for supplying water under pressure to the element, means for rotating the member, and means adjacent the free end of the tubular portion for receiving any water leaking from the end of the latter and centrifugally throwing the water around the sprinkler, said means comprising an annular recess adjacent the free end of the tubular portion and on the interior thereof, and outlet means projecting from the latter and communicating with the recess.

2. A sprinkler comprising a tubular element, means for supplying water under pressure to the tubular element, a rotary sprinkler housing on the end of the element and having a tubular portion telescopically receiving the element, means for effecting rotation of the housing, and means on the free end of such tubular portion and rotatable therewith for causing any water leaking to such free end to be thrown outwardly and away from the axis of rotation of the housing, the last mentioned means comprising a disk

on the free end of the tubular portion and axially spaced from such end and a water shed on the element between the disk and free end of the tubular portion for causing any water leaking along the element to be deposited on the disk.

3. A sprinkler comprising a tubular element having a closed end, an outwardly projecting rim on such end and apertures in its side wall inwardly of the rim, means for supplying water under pressure to the other end of the element, a sprinkler housing rotatably mounted on and receiving the first end, said housing having an interior diameter of such dimensions as to reciprocally receive the rim while allowing water to flow past the rim and into the housing above the closed end of the element and also having apertures above the rim to permit water to flow out of the housing, and a conical inner wall on the housing below the rim and adapted to cooperate therewith for contracting the space through which the water flows into the housing space above the rim depending upon vertical movement of the housing.

4. A sprinkler comprising a tubular element having a closed end, an outwardly projecting rim on such end, and apertures in its side wall inwardly of the rim, means for supplying water under pressure to the other end of the element, a sprinkler housing rotatably mounted on and receiving the first end, said housing having an interior diameter of such dimensions as to reciprocally receive the rim while allowing water to flow past the rim and into the housing space above the closed end of the element and also having apertures above the rim to permit water to flow out of the housing, and a conical inner wall on the housing below the rim and adapted to cooperate therewith for contracting the space through which the water flows into the housing space above the rim depending upon vertical movement of the housing, the outlet openings in the upper portion of the housing being located in the upper end wall thereof and being so directed as to cause the water flowing therethrough to effect turning of the housing.

5. A rotary sprinkler comprising a tubular element adapted to be connected to a water pressure line and having an outlet at its other end, a rotary sprinkler housing slidably receiving said end of the element and having sprinkler outlets, an end wall on the housing beyond the outlet on the element, means on the end of the element and cooperating with a portion of the housing for throttling the flow of water through the sprinkler outlets and varying the amount of water pressure on the end wall as the housing slides on the element and decreasing the pressure on the end wall as the housing moves outwardly, and unbalanced shoulder means on the housing and exposed constantly to the water line pressure for effecting a water pressure thrust in the opposite direction, the housing being outwardly moved until its own resistance to movement plus the water thrust against the shoulder means balances the decreasing water thrust against said end wall.

6. A sprinkler comprising a housing having a chamber, an entry bore for receiving a conduit and outlets for allowing water to be sprinkled and which communicate with the chamber, a conduit connected to a water pressure line and slidably projecting through the bore and into the chamber, means communicating the conduit with the chamber, means providing a non-counterbalanced surface area in the chamber constantly exposed to water at the line pressure and so ar-

5 ranged that the pressure acting against the area
 acts to move the housing inwardly on the conduit,
 means providing larger non-counterbalanced sur-
 face area against which water pressure will act to
 5 move the housing outwardly, and means on the
 conduit and cooperating with a portion of the
 housing during sliding movement of the housing
 on the conduit for varying the effective size of
 the outlets and the water pressure acting against
 10 the second area, so that outward movement of
 the housing gradually reduces the water pressure
 against said second surface, whereby the hous-
 ing will move in one direction or the other until
 one opposing force and the weight of the housing
 15 balance the other force.

7. A sprinkler comprising a housing having a
 chamber, an entry bore for receiving a conduit
 and outlets for allowing water to be sprinkled and
 which communicate with the chamber, a conduit
 20 connected to a water pressure line and slidably
 projecting through the bore and into the cham-
 ber, means communicating the conduit with the
 chamber, means providing a non-counterbal-
 25 anced surface area in the chamber constantly ex-
 posed to water at the line pressure and so ar-
 ranged that the pressure acting against the area
 acts to move the housing inwardly on the con-
 30 duit, means providing larger non-counterbal-
 anced surface area against which water pressure
 will act to move the housing outwardly, and
 means on the conduit and cooperating with a
 portion of the housing during sliding movement
 of the housing on the conduit for varying the
 35 effective size of the outlets and the water pres-
 sure acting against the second area, so that
 outward movement of the housing gradually re-
 duces the water pressure against said second sur-
 face, whereby the housing will move in one direc-
 40 tion or the other until one opposing force and the
 weight of the housing balance the other force,
 said means on the conduit comprising a rim on
 the end of the latter adapted to reduce the area
 of communication between the water under line
 pressure and the outlets.

45 8. A sprinkler comprising, a hollow conduit
 adapted to be connected to a water line and hav-
 ing outlet openings adjacent its end, a sprinkler
 housing having a journal opening slidably re-
 50 ceiving the end of the conduit, an inner cham-
 ber into which the end of the conduit projects, an end
 wall beyond the end of the conduit and sprinkler
 outlet openings communicating with the chamber,
 a head on the conduit between said end wall and
 55 outlets on the conduit and constructed and ar-
 ranged with respect to such outlets as to vary
 the amount the outlet openings on the housing are
 open to the chamber below the head means as the
 housing slidably moves on the conduit, and means
 60 in the chamber for causing water under the pres-
 sure it enters the chamber to exert a force direct-
 ly acting against outward movement of the hous-
 ing, the arrangement being such that water flow-
 ing past said head and against the end wall exerts
 a pressure overcoming the weight of the housing
 65 and the direct pressure against said means in the
 chamber until the head in moving over said
 sprinkler outlets so reduces the pressure against
 the end wall that it becomes balanced by the
 direct pressure against said means in the cham-
 70 ber and the weight of the housing.

9. A sprinkler comprising a water pressure con-
 75 duit line, a sprinkler housing slidably receiving
 the end of the conduit and having a chamber into
 which the end of the conduit projects and with
 which it communicates so that water may flow

through the chamber, an end wall on the housing
 beyond the end of the conduit, sprinkler outlets
 on the housing and communicating with the
 chamber, means on the conduit cooperating with
 a portion of the housing and depending on move- 5
 ment of the housing slidably on the conduit for
 gradually cutting off communication between
 the outlets and the water under line pressure
 entering the chamber and for reducing the pres- 10
 sure of the water against said end wall, and sur-
 face means in the chamber for causing the water
 entering the chamber under line pressure to con-
 stantly urge the housing inwardly in opposition
 to the pressure against said end wall, whereby
 said opposition pressures in conjunction with 15
 the weight of the housing may be balanced and
 the housing placed in a position of floating
 equilibrium.

10. A sprinkler comprising a tubular element,
 means for supplying water under pressure to the 20
 element, a member rotatably and slidably mount-
 ed on the element and having a hollow portion, a
 cap secured to one end of the element and located
 within said hollow portion, outlet means on the 25
 member and communicating with the hollow por-
 tion adjacent the cap, means communicating the
 tubular element with the hollow portion of the
 member to allow water to flow into the latter and
 to the outlet means, means for effecting sliding 30
 movement of the member through action of the
 water, and means on the cap cooperating with
 said member for variably controlling the degree
 of water discharge communication of the outlets
 with the hollow portion in a manner depending 35
 upon the sliding position of the member to de-
 crease the degree of water discharge communica-
 tion as the water pressure increases and to in-
 crease the degree of water discharge communica-
 40 tion as the water pressure decreases.

11. A sprinkler comprising a tubular element,
 means for supplying water under pressure to the 40
 element, a member rotatably and slidably mount-
 ed on the element and having a hollow portion, a
 cap secured to one end of the element and located 45
 within said hollow portion, outlet means on the
 member and communicating with the hollow por-
 tion adjacent the cap, means communicating the
 tubular element with the hollow portion of the
 member to allow water to flow into the latter and 50
 to the outlet means, means for effecting sliding
 movement of the member through action of the
 water, and means on the cap cooperating with
 said member for variably controlling the degree
 of water discharge communication of the out- 55
 lets with the hollow portion in a manner depend-
 ing upon the sliding position of the member to
 decrease the degree of water discharge communica-
 tion as the water pressure increases and to in-
 crease the degree of water discharge communica- 60
 tion as the water pressure decreases and for
 limiting the sliding position of the member.

12. A sprinkler comprising an upwardly pro-
 65 jecting tubular element, means connecting the
 lower end of the element to a source of water sup-
 ply, a hollow sprinkler housing rotatable on the
 element in water bearing relation thereto and re-
 ceiving the upper end of the element and having
 a water communication therewith and also hav-
 70 ing a downwardly projecting tubular portion open
 at its lower end and which receives the element,
 sprinkler outlets on the housing and communicat-
 ing with the interior of the latter, and means on
 the lower and open end of the tubular portion for
 causing water leaking between the element and 75

tubular portion to be thrown away from the sprinkler.

13. A sprinkler comprising an upwardly projecting tubular element, means connecting the lower end of the element to a source of water supply, a hollow sprinkler housing rotatable on the element in water bearing relation thereto and receiving the upper end of the element and having a water communication therewith and also having a downwardly projecting tubular portion open at its lower end and which receives the element, sprinkler outlets on the housing and communicating with the interior of the latter, and means on the lower and open end of the tubular portion for causing water leaking between the element and tubular portion to be thrown away from the sprinkler, said last mentioned means comprising a downwardly and outwardly flared rim at the lower end of the tubular portion wherein the flaring extends to the inner surface of the portion whereby leaking water flowing downwardly between the element and portion is directed immediately to the flared surface.

14. A sprinkler comprising a tubular central element having outlet openings adjacent one end and provided with a water pressure supply at the other end, a casing member rotatably and slidably mounted on said central element and having a hollow portion and two sets of exteriorly opening sprinkler openings communicating with said hollow portion in different radial planes, and means for effecting vertical sliding movement of the casing, said hollow portion and said central element being so constructed and arranged relative to each other that communication between one of said sets of sprinkler openings and the outlet openings in the central element is substantially cut off when the casing is in one of its slidable positions and is increasingly opened as the casing leaves said position, while the other set of sprinkler openings is in constant communication with said outlet openings, one set of said sprinkler openings being so constructed and arranged as to impart rotation to the casing during discharge of water under pressure therefrom.

15. A sprinkler comprising an upwardly directed tubular element, a hollow member rotatably mounted on the upper end of the element and having a downwardly projecting tubular portion closely receiving and rotatably mounted on the element, sprinkler outlets on the member and communicating with the interior thereof, means

communicating the upper end of the element with the interior of the member to permit the flow of water thereinto, and outlet means on the tubular portion intermediate its ends and communicating with the interior of the tubular portion and the outer surface of the element for directing and drawing water leaking downwardly between the portion and element away from the sprinkler and throwing it centrifugally away from the latter.

16. A sprinkler comprising an upwardly projecting tubular element, means connecting the lower end of the element to a source of water supply, a sprinkler housing rotatably mounted and vertically slidable on the element in water communication with the upper end thereof and having a tubular portion open at its lower end receiving the element for centering it during rotation and guiding it during sliding movement, sprinkler outlets on the housing in communication with the interior thereof, means depending on the water pressure and flow of water for effecting vertical sliding of the housing and balancing thereof on a water bearing, and means on the lower end of the tubular portion for directing and drawing water leaking downwardly between the tubular portion and outer surface of the element, centrifugally away from the sprinkler.

17. A sprinkler comprising an upwardly projecting tubular element, means connecting the lower end of the element to a source of water supply, a sprinkler housing rotatably mounted and vertically slidable on the element in water communication with the upper end thereof and having a tubular portion open at its lower end receiving the element for centering it during rotation and guiding it during sliding movement, sprinkler outlets on the housing in communication with the interior thereof, means depending on the water pressure and flow of water for effecting vertical sliding of the housing and balancing thereof on a water bearing, and means on the lower end of the tubular portion for directing and drawing water leaking downwardly between the tubular portion and outer surface of the element, centrifugally away from the sprinkler, said last mentioned means comprising outlets on the tubular portion communicating with the interior thereof for centrifugally drawing water leaking downwardly, away from the sprinkler and throwing it outwardly therefrom.

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