June 3, 1930. F. HENKEL 1,760,903

SPRINKLER HEAD

Filed Feb. 2, 1927 2 Sheets-Sheet 1

Fig. 1.

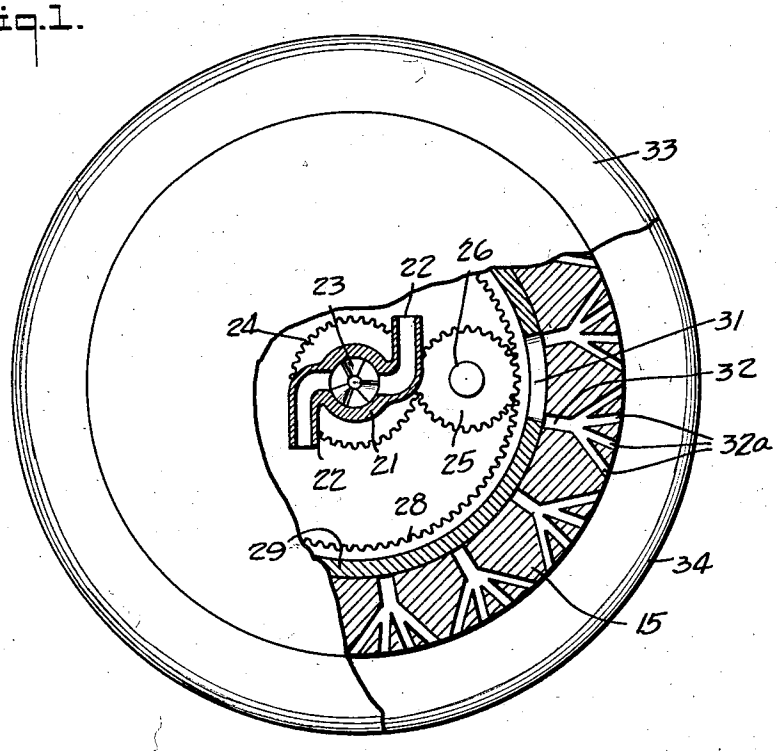



Fig. 2.

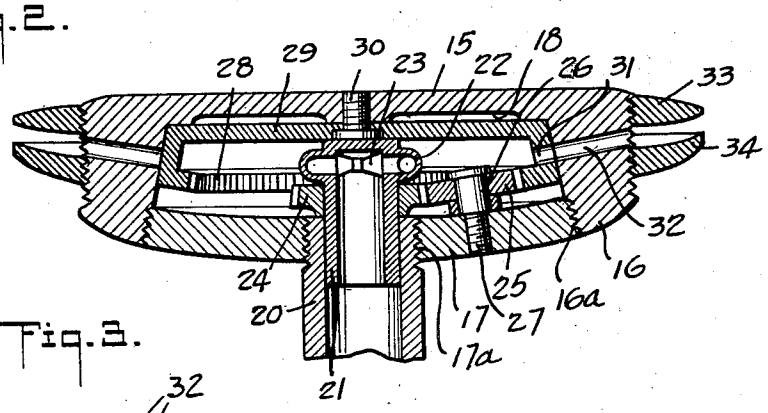
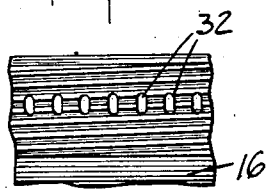



Fig. 3.

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June 3, 1930. F. HENKEL 1,760,903

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Filed Feb. 2, 1927 2 Sheets-Sheet 2

Fig. 4.

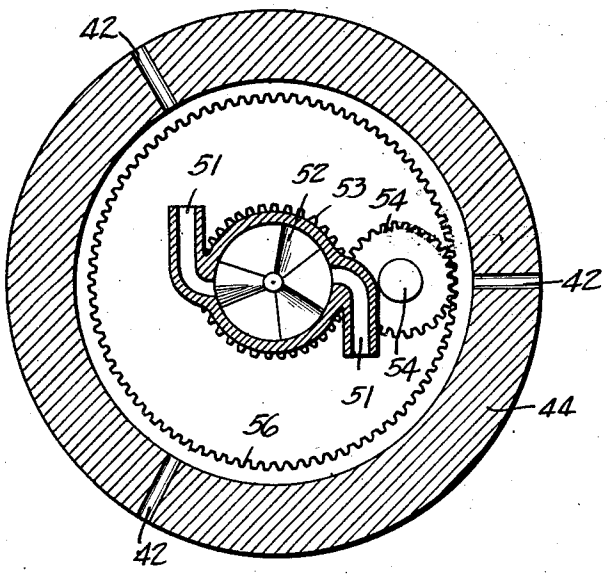
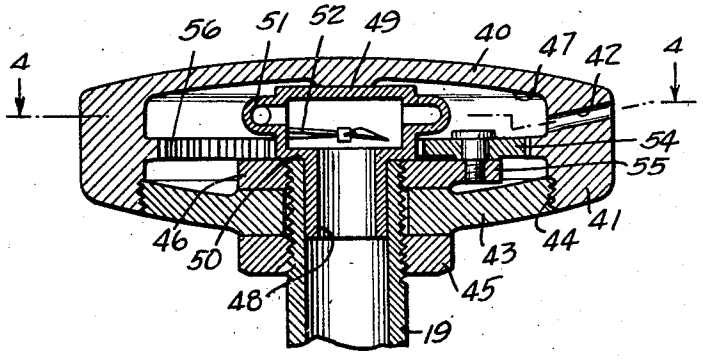



Fig. 5.

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Patented June 3, 1930 1,760,903

# UNITED STATES PATENT OFFICE

FREDERICK HENKEL, OF LOS ANGELES, CALIFORNIA

## SPRINKLER HEAD

Application filed February 2, 1927. Serial No. 165,431.

My invention relates to sprinkler heads of the rotary type adapted for use in the sprinkling of lawns and the like, and it is a purpose of my invention to provide a sprinkler head which operates with a minimum quantity and pressure of water and in a manner to produce a maximum of slow and even distribution over a given area of ground, my invention being particularly adapted for lawn sprinkling systems where the reduction of feeder lines as to size and extent is of large economical importance.

It is also a purpose of my invention to provide a sprinkler head which is adjustable to control the area of ground sprinkled, the moving parts of the head being completely encased to prevent damage thereof, yet readily accessible for cleaning and repair.

I will describe only two forms of sprinkler heads each embodying my invention, and will then point out the novel features thereof in claims.

In the drawings

Figure 1 is a view showing in top plan and partly in section one form of sprinkler head embodying my invention;

Figure 2 is a central vertical sectional view of the sprinkler head shown in Figure 1;

Figure 3 is an enlarged fragmentary view of a portion of the outer periphery of the stationary body of the sprinkler head shown in the preceding views;

Figure 4 is a horizontal sectional view taken on the line 4—4 of Figure 5, showing another form of sprinkler head embodying my invention;

Figure 5 is a central vertical sectional view of the head shown in Figure 4.

Referring specifically to the drawings, and particularly to the form shown in Figures 1, 2 and 3, my invention in its present embodiment comprises a stationary body formed of metal or other suitable material of inverted cup shaped form, the body including a disk portion 15 and an annular portion 16 formed integral with and depending from the marginal edge of the disk portion. The annular portion is screw threaded as indicated at $16^a$ to threadedly receive a closure disk 17 and to thereby provide within the body a chamber 18 in which the moving parts of the head are adapted to work. The closure disk 17 is provided axially with an opening $17^a$ in which is threadedly received the upper end of a pipe 20 by which water is supplied interiorly of the head. A tubular shaft 21 is rotatably fitted in the upper end of the pipe 20, and this shaft is constructed to provide tangential and reversely disposed spouts 22 through which water is discharged in a manner to effect rotative movement of the shaft 21 as will be understood by those skilled in the art. As shown in Figure 2, the upper end of the shaft is closed while within the shaft adjacent the closed end and at the inlet ends of the spouts 22 is arranged a propeller 23 consisting of a plurality of spirally disposed blades which operate to assist the spouts in effecting rotation of the shaft by the circulation of water against and between the blades, it being understood that the blades are fixed within the shaft.

As illustrated in Figure 2, a gear 24 is fixed to the shaft 21, and this gear constantly meshes with a smaller gear 25 mounted on a stub axle 26 having an extension 27 threaded in the closure disks 17. The gear 25 in turn constantly meshes with an internal ring gear 28 formed on an inverted cup shaped member 29. The member 29 has a rotating fit within the chamber 18 and is rotatably supported therein by means of a headed screw 30 threaded in the disk portion 15 of the body. This member 29 is provided with a control port 31 through which water supplied to the chamber 18 can be discharged through any two adjacent discharge ports 32 formed in the annular portion 16, under the rotative movement imparted to the member through its operative connection with the shaft 21. As clearly shown in Figure 1, the annular portion 16 is provided with a circular series of discharge ports 32 arranged at regular spaced intervals and having their exit ends elongated vertically as shown in Figure 3. Each port 22 is provided with a plurality of branch ports $32^a$ which constitute the outlet end of the port and extend in different directions in order to project streams of water in different directions and thereby spray a relatively large

area of ground. In the present instance the arrangement of branch ports of any one discharge port is such that the jets of water will intersect the jets emanating from the branch ports of an adjacent discharge port for the purpose of effecting even distribution of the water over a given area of ground.

For the purpose of controlling the trajectory of the water streams as discharged from the branch ports 32ª as well as controlling the quantity of water discharged, both for the purpose of sprinkling a predetermined area of ground and square areas as well as round areas, I provide two rings 33 and 34 threaded on the outer periphery of the annular portion 16 to permit adjustment thereof vertically on the body. It will be clear that by adjusting the rings toward each other the outer ends of the branch ports 32ª will be constricted, thus regulating the amount of water discharged from such ports. It is to be noted that the confronting sides of the rings 33 and 34 are concaved and convexed respectively in order that the streams of water leaving the branch ports may be directed upwardly. The trajectory of such streams can thus be regulated to increase or decrease the area sprayed by the head by vertical adjustment of the rings. As the rings are adjusted upwardly the trajectory of the streams is increased, and conversely as the rings are adjusted downwardly the trajectory is decreased.

In the operation of the sprinkler head the water supplied to the shaft 21 from the pipe 20 effects continuous rotation of the shaft through the action of the water engaging the blades of the propeller 23 and subsequently discharging from the spouts 22. The water as discharged from the spouts is received in the chamber 18 and under the rotative movement of the member 29 through its operative connection with the shaft the control port 31 is caused to describe a circular movement to successively register with the inlet ends of the discharge ports 32, thus permitting the water to be discharged successively from pairs of discharge ports throughout the entire series. In this manner the sprinkler head continuously functions to project streams of water progressively about its circumference, the water as discharged from each port being divided into a plurality of streams which cross those of an adjacent port. It is of course understood that the discharge of water from any one port is only momentary, the control port in its continued movement discontinuing the supply of water to the port. By this operation the streams emanating from any one port are caused to gradually increase in trajectory from the time the port is partly opened until it is fully opened, and conversely the trajectory decreased to zero as the port is closed. In this manner the streams are caused to rise and fall when the sprinkler head is assembled, thereby spraying the intervening ground between the sprinkler head and the point defined by the streams in their maximum trajectory. Of course the distance and quantity of the sprays can be regulated by an adjustment of the rings 33 and 34 as has been described. Should it be desired to spray a half circle area of ground or any area which is less than the normal entire area sprayed by the sprinkler head as constructed in Figures 1 and 2, certain of the discharge ports 32 can be eliminated so as to restrict the water discharged from the head to the given area.

Referring now to Figures 4 and 5. I have here shown another form of sprinkler head embodying my invention which comprises an inverted cup shaped member having a disk portion 40, from the marginal edge of which depends an annular portion 41 provided with circumferentially spaced and radially disposed discharge ports 42. The lower side of the member is closed by a disk 43 having screw threaded engagement at its periphery with the inner face of the annular portion 41 as indicated at 44. This disk is provided with a central opening through which extends the upper end of the water supply pipe 19 and the disk is rotatably mounted on the pipe through the medium of nuts 45 and 46 threaded on the pipe and between which the hub portion of the disk is disposed. As the disk 43 is connected to the member comprising the portions 40 and 41, it will be clear that such member is likewise rotatable on the pipe 19, the disk also co-operating with the member to provide within the latter a chamber 47 into which water from the pipe 19 is discharged and from the member through the ports 42.

A tubular shaft 48 is extended into the upper end of the pipe 19, the upper end of the shaft being provided with a head 49 enlarged with respect to the shaft to provide a shoulder 50 for limiting the downward movement of the shaft into the pipe. This head is hollow as shown and is provided with tangentially disposed spouts 51 which function in the same manner as the spouts 22 of the sprinkler head shown in Figure 1. Similarly a propeller 52 is fixed within the head to aid the spouts in rotating the shaft 48. The rotational movement of the shaft is imparted to the member through the medium of a gear 53 formed on the head 49 and constantly meshing with a smaller gear 54 rotatable upon an extension 55 of the nut 46. The gear 54 constantly meshes with an internal ring gear 56 formed on the inner periphery of the annular portion 41.

In the operation of this sprinkler head the water in its passage from the pipe 19 to the chamber 47 causes rotation of the shaft 48 and through the gears 53 and 54 rotation of the member so that the streams of water as

discharged from the ports 42 are caused to move in circular paths, thereby spraying an area of ground around the sprinkler head, depending upon the trajectory of the streams. This form of sprinkler head is similar to that shown in Figure 1 in that it is provided with substantially the same propelling means but it is to be noted that the streams of water emanating from the head are continuous and not intermittent as in the first form. In both forms of my invention the rotational movement of the head is relatively slow by virtue of the reduction gearings, and it is by means of this relatively slow movement that the head functions to thoroughly spray an area of ground. Further, by reason of the restricted discharge ports as well as the propelling mechanism the head will operate with a minimum water supply and of a relatively low pressure, thereby permitting the reduction of feeder lines as to size and extent.

Although I have herein shown and described only two forms of sprinkler heads each embodying my invention, it is to be understood that various changes and modifications may be made without departing from the spirit of the invention, and within the spirit and scope of the appended claims.

I claim:

1. A sprinkler head comprising a tubular shaft adapted for rotational mounting in a water supply pipe, tangentially disposed spouts on the shaft through which water is discharged from the shaft in a manner to effect rotational movement of the latter, a bladed propeller within the shaft for assisting the spouts in rotating the shaft, and a member rotatable by the shaft and receiving the water as discharged from said spouts, said member having a port therein through which the water is discharged from the member.

2. A sprinkler head comprising a rotatably mounted tubular shaft through which water from a source of pressure supply is adapted to pass, tangentially disposed spouts on the shaft through which water is discharged from the shaft in a manner to effect rotational movement of the latter, a bladed propeller within the shaft for assisting the spouts in rotating the shaft, a member rotatable by the shaft and receiving the water as discharged from said spouts, said member having a port therein through which the water is discharged from the member, a stationary body housing the shaft and member and having ports therein with which the port of the member is adapted to successively register.

3. A sprinkler head comprising a rotatably mounted tubular shaft through which water from a source of pressure supply is adapted to pass, water outlets on the shaft by which the water as discharged from the shaft is caused to rotate the latter, a member mounted for rotational movement and in receiving relation to the water as discharged from the shaft, a gear fixed to the shaft, a ring gear on the member, an intermediate gear operatively connecting the two gears to transmit the rotary motion of the shaft to said member, and a port in the member through which the water interiorly thereof is discharged from the member.

4. A sprinkler head comprising a rotatably mounted tubular shaft through which water from a source of pressure supply is adapted to pass, water outlets on the shaft by which the water as discharged from the shaft is caused to rotate the latter, a member mounted for rotational movement and in receiving relation to the water as discharged from the shaft, a gear fixed to the shaft, a ring gear on the member, an intermediate gear operatively connecting the two gears to transmit the rotary motion of the shaft to said member, and a port in the member through which the water interiorly thereof is discharged from the member, and a stationary body housing the shaft, gearing and member and provided with water discharge ports with which the port of the member is adapted to successively register.

5. A sprinkler head comprising a rotatably mounted tubular shaft through which water from a source of pressure supply is adapted to pass water outlets on the shaft by which the water as discharged from the shaft is caused to rotate the latter, a member mounted for rotational movement and in receiving relation to the water as discharged from the shaft, a gear fixed to the shaft, a ring gear on the member, an intermediate gear operatively connecting the two gears to transmit the rotary motion of the shaft to said member, and a port in the member through which the water interiorly thereof is discharged from the member, a stationary body housing the shaft, gearing and member and provided with water discharge ports with which the port of the member is adapted to successively register, and means adjustably mounted on the body to cover the outlet ports to a greater or less extent so as to vary the effective opening of the outlet ports.

6. A sprinkler head comprising a stationary body to which water is adapted to be supplied interiorly thereof, the body having an annular valve seat therein provided with a circumferential series of water outlet ports, a valve in the body rotatable on said valve seat and controlling said water outlet ports, the valve having a control port positioned to register with the water outlet ports in successive order as the valve is rotated and capable of registering with at least two water outlet ports at one and the same time so that at least one of the latter ports will at all times be open, and means operable by the water supplied to the body for rotating the valve.

7. A sprinkler head as embodied in claim 6, wherein each outlet port is provided with branch ports which are arranged to project streams of water in different directions with certain of the streams of one outlet port crossing certain of the streams of an adjacent outlet port.

8. A sprinkler head comprising a stationary body to which water is adapted to be supplied interiorly thereof, the body having a circular series of water outlet ports therein, a member rotatable in the body and constituting a valve closing the water outlet ports of the body, the member having a control port positioned to register with the water outlet ports in successive order as the member is rotated, means for rotating the member, and means adjustably mounted on the body to cover the outlet ports to a greater or less extent so as to vary the effective opening of the outlet ports and hence the volume of water capable of being discharged therefrom.

9. A sprinkler head comprising a stationary body to which water is adapted to be supplied interiorly thereof, the body having a circular series of water outlet ports therein, a member rotatable in the body and constituting a valve closing the water outlet ports of the body, the member having a control port positioned to register with the water outlet ports in successive order as the member is rotated, means for rotating the member, and means adjustable on the body and correlated with the outlet ports, by which the streams of water discharging from the outlet ports can be deflected from their normal paths and in a vertical direction so as to vary the trajectory of the streams of water discharging from the outlet ports.

10. A sprinkler head comprising a stationary body to which water is adapted to be supplied interiorly thereof, the body having a circular series of water outlet ports therein, a member rotatable in the body and constituting a valve closing the water outlet ports of the body, the member having a control port positioned to register with the water outlet ports in successive order as the member is rotated, means for rotating the member, and means adjustable on the body and correlated with the outlet ports, by which the streams of water discharging from the outlet ports can be deflected from their normal paths and in a vertical direction so as to vary the trajectory of the streams of water discharging from the outlet ports, said last means comprising a pair of rings threaded on the body, having confronting deflecting surfaces between which the streams of water discharging from the outlet pass and are deflected.

11. A sprinkler head comprising a stationary body to which water is adapted to be supplied interiorly thereof, the body having a circular series of water outlet ports therein, a member rotatable in the body and constituting a valve closing the water outlet ports of the body, the member having a control port positioned to register with the water outlet ports in successive order as the member is rotated, means for rotating the member, and means adjustable on the body and correlated with the outlet ports, by which the streams of water discharging from the outlet ports can be deflected from their normal paths and in a vertical direction so as to vary the trajectory of the streams of water discharging from the outlet ports, said last means comprising a pair of rings threaded on the body, having confronting deflecting surfaces with the surfaces inclined in a vertical plane with respect to the normal path of the streams of water discharging from the outlet ports so that when one or both of the rings are adjusted on the body into the path of the streams of water, the latter will be deflected to vary the trajectory thereof.

12. A sprinkler head comprising a member rotatably mounted on a water pipe, said member being provided with water inlet and discharge ports, and means within the member by which the water supplied to the member is utilized to rotate the latter and to subsequently discharge from said ports, said means comprising a rotatably mounted tubular shaft for receiving water from said pipe, tangentially disposed spouts on the shaft through which water is discharged from the shaft in a manner to effect rotation of the latter, and gear means for so operatively connecting said shaft to said member as to effect rotation of the latter in response to rotation of the shaft.

13. A sprinkler head comprising a member rotatably mounted on a water pipe, said member being provided with water and discharge ports, and means within the member by which the water supplied to the member is utilized to rotate the latter and to subsequently discharge from said ports, said means comprising a tubular shaft for receiving water from said pipe, tangentially disposed spouts on the shaft through which water is discharged from the shaft in a manner to effect rotation of the latter, and means for operatively connecting said shaft to said member, comprising a reduction gearing by which the member may be rotated at a decreased speed with respect to the rotational speed of the shaft.

14. A sprinkler head comprising a stationary body to which water is adapted to be supplied interiorly thereof, the body having a circular series of water outlet ports therein, a member rotatable in the body and constituting a valve closing the water outlet ports of the body, the member having a control port positioned to register with the water outlet ports in successive order as the member is rotated, means for rotating the member, and means common to all the outlet ports adjustably mounted on the body to cover the outlet

ports to a greater or less extent so as to vary the effective opening of the outlet ports and hence the volume of water capable of being discharged therefrom.

15. A sprinkler head comprising a member rotatably mounted on a water pipe, said member being provided with water inlet and discharge ports, and means within the member by which the water supplied to the member is utilized to rotate the latter and to subsequently discharge from said ports, said means comprising a rotatably mounted tubular shaft for receiving water from said pipe, tangentially disposed spouts on the shaft through which water is discharged from the shaft in a manner to effect rotation of the latter, and means for so operatively connecting the shaft and member as to effect rotation of the latter in response to rotation of the shaft and at a speed different than the shaft.

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