May 10, 1927. 1,628,041

R. F. FRYE

AUTOMATIC LAWN SPRINKLER

Filed May 28, 1924

Fig. 2

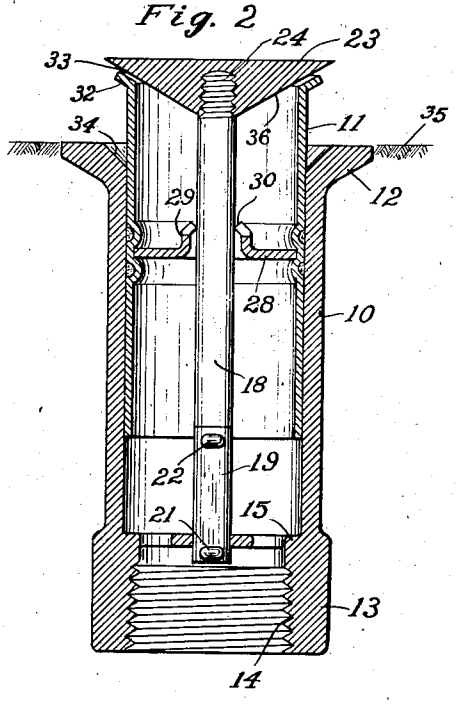


Fig. 1

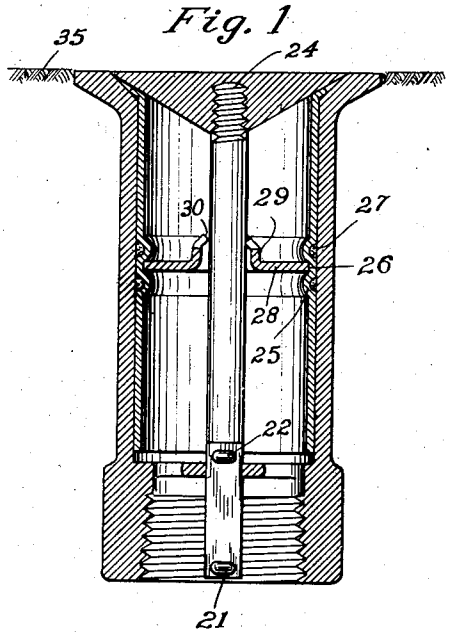


Fig. 5

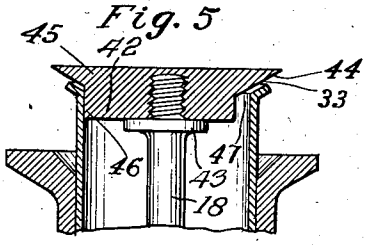


Fig. 3

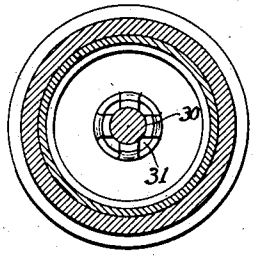


Fig. 6

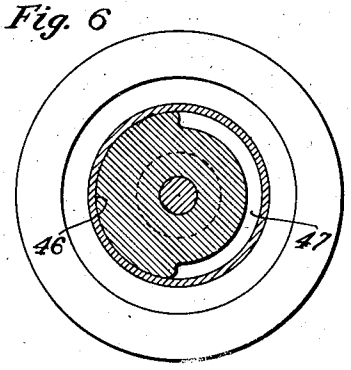
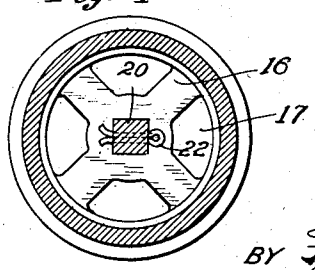


Fig. 4



INVENTOR
Ray F. Frye
BY Frank D. Gray
ATTORNEY

Patented May 10, 1927. 1,628,041

UNITED STATES PATENT OFFICE.

RAY F. FRYE, OF CLEVELAND, OHIO.

AUTOMATIC LAWN SPRINKLER.

Application filed May 28, 1924. Serial No. 716,364.

This invention relates to sprinkler devices and more especially to lawn sprinklers of the character which provide a disappearing sprinkler head which automatically recedes within the ground to the level of the lawn surface when the water pressure is shut off by a valve in the supply pipe.

It is my purpose in this disclosure to set forth a suitable automatic means for not only raising the spray head when the water is turned on by the said valve, but also for automatically controlling the spray sheet of water as the pressure in the supply pipe line varies because of use of the water supply by other parties to a point that the pressure falls accordingly, and which by mechanism heretofore used, resulted in a great variance in the character of sheet discharged from the nozzle, as the result of this varying pressure.

It has been old for some time to provide nozzles of this type with means for adjustment to vary the water sheet discharged from the nozzle, and it has been possible to adjust the nozzle to furnish the desired character of spray with a particular pressure in the supply line; but this adjustment cannot well be made as often as the pressure changes, and it is well known that this pressure varies greatly through the day and on different days, depending somewhat upon the temperature of the air. At some hours the pressure suffers a quite abrupt change, and a little later again reverts to the average pressure for the hour and season.

It is an object of my invention, therefore, to provide a spray nozzle having adjustable parts to determine the size of water sheet to be discharged therefrom, but which shall be controlled directly by the water pressure in the sprinkling mechanism, so that, as the pressure varies for any reason, the parts discharging the water spray will by the same pressure be adjusted to compensate for the variation, and thereby result in an even spray sheet from a varying pressure of supply and this without manual adjustment of the nozzle at any time. This is a greatly improved construction for which there has been a great demand, and which is believed to be practicable and readily applied where ever lawn sprinklers are installed.

This invention further consists in the novel construction, arrangement and combination of parts, members and features, illustrated in the accompanying drawings and pointed out in the appended claims.

In the drawings:

Figure 1 is a vertical section of my device which latter is shown in retracted position below the surface of the ground;

Figure 2 is a similar view showing the spraying head and cylinder in raised position;

Figure 3 is a transverse section taken in a plane just above the intermediate plate;

Figure 4 is a transverse section taken in a plane below the intermediate plate;

Figure 5 is a vertical section showing a modified form of the upper parts of the spraying mechanism, and

Figure 6 is a transverse section of the modified form just above the base of the spray head.

Referring to the drawings, in which corresponding parts are designated by the same reference characters throughout the specification, 10 designates generally the sprinkler, and more especially the fixed cylinder secured in position in the lawn, the upper end 12 being substantially level with the lawn surface 35, and the lower end 13 adapted to be secured by a threaded opening 14 to a suitable supply pipe connected to a source of water supply.

Within the cylinder 10 the inner cylinder 11 is mounted for vertical movement therein, it having certain beaded structure 25 used to receive externally suitable packing 27, and providing an interior trough or groove 26. Within this groove is fixed the circular plate or disk 28 having central portions 31 notched out leaving radial arms 29 which are bent upward and inward at 30 to provide a guiding aperture through which the vertical stem 18 may reciprocate. The inner face of the base 13 is formed with a reduced shoulder 15 to receive the lower end of the cylinder 11 when the latter is in the lower position. The lower end of the stem 18 is made non-circular as at 19 and it reciprocates in a fixed guide having arms 16 secured to the shoulders 15 with openings 17 between the arms and a central aperture for the part 19. The latter is provided with a pair of cotter pins 21 and 22 to limit the upper and lower movement of the stem, said cotter pins being arranged respectively above and below the guide.

The upper end of the stem is secured to the spray head 23, usually by threading the

end of the stem, as at 24 and inserting the same in a corresponding socket in the head. The latter is conical in shape with the apex below where the stem is attached. The lateral surface 36 of the head serves to assist in directing the sheet of water outward. The upper edge of the cylinder 11 is flanged outwardly at 32 obliquely, at an angle to fit the surface 36, and is normally spaced from such surface the thickness 33 of the spray sheet. The inner edge of the fixed cylinder 10 at its upper end is notched out at 34 to provide a neat fit when the edges of the head and the flange 32 recede to the surface level as shown in Fig. 1.

It is to be noted especially that the guide having the arms 16, is fixed to the part 13—usually integral therewith, so that if the lower end 19 is non-circular as, for example, square in cross-section designated by 20 in Fig. 4, the cylinder 10 will prevent relative rotation of the stem and its head.

Operation: It is clear that the stem and its head may reciprocate substantially the distance between the cotter pins and that they may move together within the outer fixed cylinder 10. When, therefore, the parts are assembled in the manner shown in Figs. 1 and 2, and the spray head is in the lowered position of the former view, a rush of water upward through the openings 17 from the supply pipe below when the control valve is opened, will rise until the plate 28 is reached where an upward pressure will be exerted thereagainst causing the raising of the parts 11, 18 and 23 together, until the pin 21 strikes the lower face of the fixed guide, when the stem and head will be held against farther upward movement. In the meantime, the water will continue to flow upward through the openings 31 in the plate 28 until ultimately, the cavity between parts 23 and 28 is filled and an hydraulic pressure will be exerted both against the lower surface 36 of the spray head 23, and the upper surface of the plate 28.

The pressure of the water within this cavity finally separates the flange 32 from the head 23, since cylinder 11 is yieldable, until escape is provided for the water in an annular sheet through the space 33. While this hydraulic pressure tends to open the spray head; a compensating tendency to close the space 33 arises because of the slightly reduced pressure on the surface 36 resulting from the relief afforded by the escaping liquid through 33, and consequent reduction of pressure on the upper surface of part 28 by the same relief, the pressure on the lower surface of plate 28 remaining substantially constant. When, therefore, the internal pressure on the walls of the said cavity is reduced, the pressure on the lower surface of plate 28 tends to close the space 33, while an increase of such internal pressure tends to separate parts 23 and 28, so that these opposing forces—one tending to close the space 33, and the other tending to open it, serve effectually to automatically control the volume of water in the spray sheet. And this automatic action will vary in accordance with the pressure of water in the supply source. It results therefore that the parts 11 and 23 are adjusted automatically by the water pressure itself, the sheet being reduced as the pressure is increased, and enlarged by the increased space at 33 as the hydraulic pressure of the supply is lowered. This is a very desirable result and not, to my knowledge, before accomplished.

In some conditions it may be desirable to limit the arc within which the water may escape about the head 23. I have provided the modification illustrated in Figs. 5 and 6. Here the lower parts of the mechanism are substantially identical with those shown in the main form. The spray head 45, however, is not formed conical in contour, but is provided with a lower extension 42 fitting closely the cylinder 11 about a portion of said extension at 46 and spaced at 47 from the cylinder and leading to the space 33 at that point as in the preferred form. The stem 18 may be provided with a shoulder 43 if desired, though it is not essential. This form of spray head is especially desirable for location where it is a disadvantage to have a continuous spray sheet about the head. This will be used, for example, at the corner of a building where the extent of spray should be limited to 45 degrees only, and not permitted to be thrown against the building or a wall thereof. The automatic control of the space at 33 is identical with that in the other views. This modified form may also be used when near the limit of an enclosure, in which case it may be desirable to limit the spray sheet to the lot in which it is located.

Having thus disclosed my invention, what I claim and desire to secure by Letters Patent is:

1. A lawn sprinkler comprising a body portion, a spraying device mounted for reciprocation in said body portion, means for automatically raising the spraying device above the body portion, said means operating to automatically adjust the volume of water emitted from said spraying device.

2. A lawn sprinkler comprising a body portion, a spraying device mounted within said body portion for vertical reciprocation therein, means actuated by water pressure for raising the spraying device above the body portion, said means operating to automatically adjust the volume of water emitted from said spraying device.

3. A lawn sprinkler comprising a cylindrical body portion, a spraying device mounted within said body portion for vertical reciprocation therein and comprising

an open-ended cylinder and a conical spray head fitting in said cylinder with its edges overlapping the same and freely movable relative to the cylinder within defined limits, and an apertured plate secured to and within said cylinder remote from the spray head, whereby hydraulic pressure applied upwardly against the plate and spray head will raise the spraying device above the body portion, and operate to automatically adjust the volume of water emitted from said device between the cylinder edges and the spray head.

4. A lawn sprinkler comprising a stationary body portion, a spraying device mounted for reciprocation in said body portion and comprising a hollow cylinder, a spray head movable toward and from the upper end of the cylinder to close and open the same and a bar within the cylinder secured at one end to said spray head and connected at its lower end to said body portion to limit its vertical movement in both directions, and an apertured plate surrounding said bar and secured to and within said cylinder whereby hydraulic pressure of liquid upon said plate within the cylinder may automatically adjust the parts of the spraying device.

5. A lawn sprinkler comprising two hollow cylinders mounted telescopically one embedded in the ground and the other movable axially within the first, an apertured plate secured within the stationary cylinder and spaced somewhat from its lower end, a plate having a central aperture and secured within the movable cylinder, a spray head movable to open and close the upper end of the movable cylinder and control means having free movement through the central aperture of the movable plate and having limited movement relative to the stationary plate, for opening and closing the spray head.

6. A lawn sprinkler comprising two hollow cylinders arranged telescopically, the inner one movable within the other, the upper end of the inner cylinder having a spray head for closing the same and an apertured plate fixedly secured to a lower part thereof, and means connected with the stationary cylinder for limiting the reciprocation of the spray head, whereby hydraulic pressure against the head and plate from below will cause a limited upward movement of the head and cylinder, and, when the limit of the upward movement is reached, will control the relative spacing movement of the cylinder and the spray head, depending upon the force of such pressure.

7. A lawn sprinkler comprising two telescopically arranged cylinders, the inner cylinder being hollow, a circular plate having a central aperture and fixedly secured to the inner surface of the movable cylinder, a spray head adapted to cover the upper end of the latter and having a limited arc of its periphery conical in form and the remainder of its periphery cylindrical in shape, whereby movement of the spray head above the end of the inner cylinder will limit the spray sheet emitted therefrom to a predetermined arc only, a rod movable through said aperture and secured at one end to said spray head and having means at the other for limiting the extent of its reciprocation relative to the outer cylinder.

8. A lawn sprinkler comprising a stationary, hollow body having an outwardly flanged end, a hollow cylinder movable axially in said body, a spray head having free but limited movement relative to said cylinder and having an inclined lateral surface fitting in said cylinder end with its edges overhanging the same, the cylinder having an outwardly-flanged end, and an apertured plate secured to and within the said cylinder intermediate its ends, for raising the cylinder by hydraulic pressure, and for permitting flow of liquid through the plate apertures whereby to control automatically the relative distance between said spray head and the flanged end of the cylinder.

9. A lawn sprinkler comprising two hollow cylinders arranged telescopically, the inner one movable axially relative to the other, and the outer being fixed in the ground and having threaded means for attachment to a supply pipe, a spray head movable upon the inner cylinder end and limited in its movement by connections with the outer cylinder, and means operated by the pressure of the flowing water for raising the inner cylinder and spray head to a working position above the surface of the ground and adjusting the relative position of the cylinder and head to vary the quantity of liquid emitted therefrom.

In testimony whereof I hereunto affix my signature.

RAY F. FRYE.