

Nov. 4, 1969

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3,476,322

LAWN SPRINKLER NOZZLE

Filed April 13, 1967

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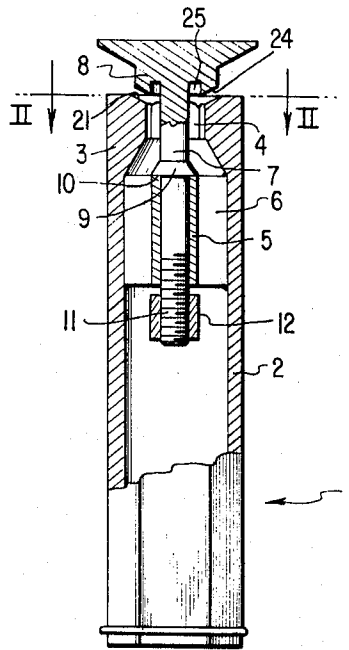
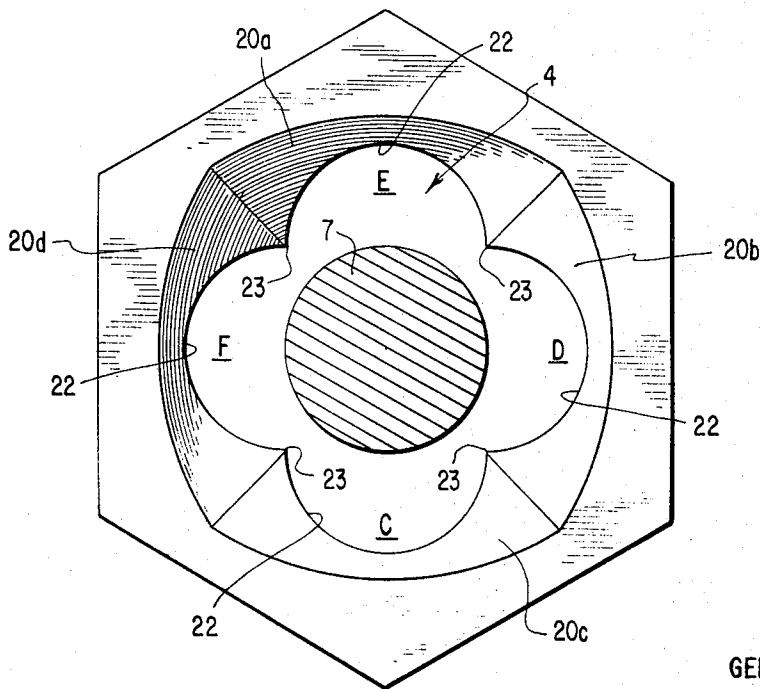


FIG. 1

FIG. 2



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2 Sheets-Sheet 2

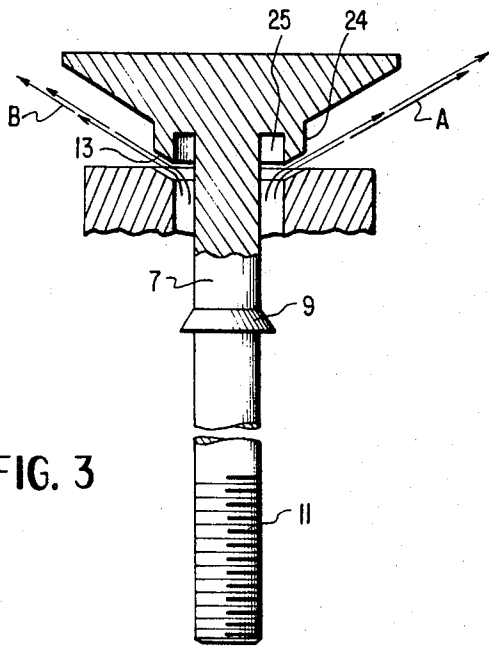


FIG. 3

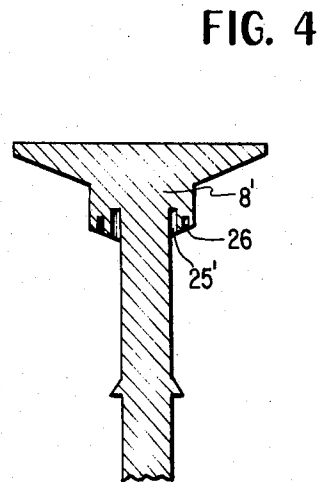


FIG. 4

FIG. 5

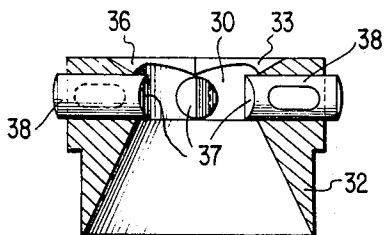
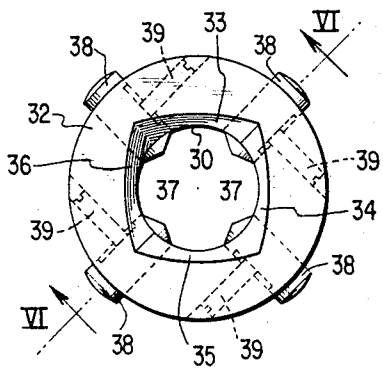


FIG. 6

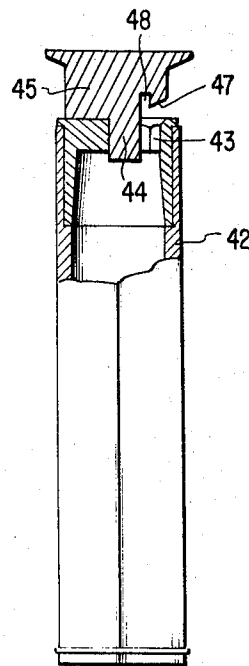


FIG. 7

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LAWN SPRINKLER NOZZLE

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Filed Apr. 13, 1967, Ser. No. 630,634

Int. Cl. B05b 1/26

U.S. Cl. 239—515

12 Claims

ABSTRACT OF THE DISCLOSURE

A lawn sprinkler nozzle comprising a casing having a full clover-leaf or a partial clover-leaf shaped orifice and a deflection head integral with a valve stem which is mounted in the casing and extends through the orifice, the deflection head overlies the orifice and cooperates with the orifice to deflect the water coming through the orifice.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates to spray devices and more particularly to improvements in lawn sprinkler nozzles.

Description of the prior art

This invention is an improvement over the invention described and claimed in applicant's United States Patent No. 3,207,446, issued Sept. 21, 1965, entitled, "Sprinkler Head for Water Sprinkling Systems."

The annular opening in a sprinkler nozzle has in the past been shaped approximately the same as the outline of the water pattern which is sought to be sprayed from the nozzle. For example, if a square water pattern was desired there would be provided a substantially square opening in the sprinkler nozzle. Also, this precise angular pattern could be maintained only within a narrow range of opening between the top of the nozzle casing and the deflection head. If the opening is increased the pattern will round out and if the opening is decreased the corners will be accentuated.

Lawn sprinkler nozzles of the type to which this invention pertains now on the market have one very serious drawback in that they sprinkle too much water per unit area per unit time. Very few of such nozzles, if any, can sprinkle less than one inch of water per unit area per hour. This amount of waterfall cannot be tolerated on many types of soil because the soil may waterlog or erode. Also, most domestic water systems have a rather limited capacity of water flow per minute which limits the area that can be sprinkled at one time through sprinkler nozzles which distribute a high volume of water. For example, the water inlet pipe to most Canadian city homes is three-quarter inch internal diameter, providing a water flow of 7 to 9 gallons per minute at a pressure of approximately 20 pounds per square inch. At one inch per hour of waterfall this would permit coverage of a lawn area of only 800-1,000 square feet.

In previous designs of sprinkler nozzles, the underside of the deflection head of the nozzle has been formed as an annular surface which is a surface of frustums of right cones. Such surfaces are generally inclined at an acute angle to the horizontal of about 20° or 30°. These surfaces act as deflection surfaces for the fast flowing water column rising through the nozzle. A small diameter column of water striking the underside of the deflection head will lose considerable radial velocity due to the surface friction. As a result, the range of deflected water and the area of lawn sprayed is less than the ideal.

SUMMARY OF THE INVENTION

In brief, the present invention is a sprinkler nozzle for

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sprinkling lawns with water. The sprinkler nozzles comprise a casing with a full clover-leaf or partial clover-leaf shaped orifice in one end of the casing. A valve stem extends through the orifice and is mounted in the casing. A deflection head is integral with the valve stem and overlies the end of the casing containing the orifice and cooperates with the orifice to deflect the water coming through the orifice.

It is an object of this invention to provide for use in a lawn sprinkling system a lawn sprinkler nozzle which will distribute less water per unit area per unit time.

It is a further object of this invention to provide a lawn sprinkler nozzle having an orifice of improved configuration which will concentrate maximum water volume against a deflection head having a minimum surface area against which the water can lose its radial velocity.

It is a further object of this invention to provide for a sprinkler nozzle a deflection head of such construction that the surface friction developed by the impinging water will be minimized, resulting in increased radial velocity of water spray.

It is a further object of this invention to provide for a sprinkler nozzle in which the opening between the top casing of the nozzle and the deflection head may vary without in any way lessening the accuracy of the spray pattern.

These and other objects and advantages are apparent from the following description taken with the accompanying figures of the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a cross-sectional view of the sprinkler nozzle of this invention;

FIG. 2 is a detail view in partial section taken along the line II—II of FIG. 1;

FIG. 3 is a cross-sectional view of the deflection head of the sprinkler nozzle of FIG. 1;

FIG. 4 is a cross-sectional view of another embodiment of the deflection head for a sprinkler nozzle;

FIG. 5 is a plan view showing an alternative construction of an orifice;

FIG. 6 is a cross-sectional view of the orifice of FIG. 5 taken along the line VI—VI;

FIG. 7 is a cross-sectional view of a further embodiment of a sprinkler nozzle.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As illustrated in FIG. 1 the sprinkler nozzle 1 according to this invention comprises a casing 2 with a tapered portion 3 at one end thereof. An orifice 4 is formed in the tapered portion. A short tube 5 is fixed in the interior of the casing 2 below the tapered portion 3 by any suitable means, such as by radial fins 6. A valve stem 7 including a deflection head 8 is mounted in the short tube 5 so that an annular shoulder 9 of the valve stem 7 rests on a top edge 10 of the tube 5. The lower end 11 of the valve stem 7 extends beneath the lower end of the tube 5 and is threaded to receive a nut 12 to retain the deflection head in a fixed position in relation to the orifice 4. The position of the nut 12 will control the amount of the opening between the top of the casing 2 and the deflection head 8. The larger the opening the larger the spray pattern that can be obtained.

The deflection head 8 is located in relation to the top of the casing 2 so that a stream of water emerging from the orifice 4 contacts the undersurface 13 of the deflection head 8 and is deflected as shown by the arrows A and B in FIG. 3.

The design of the orifice 4 is shown in FIG. 2. Four concavely curved surfaces 20a, 20b, 20c and 20d surround

the top inner edge 21 of the orifice 4. Scalloped sides 22 are provided on the inner edges of surfaces 20a, 20b, 20c and 20d. The intersection of each of the edges of the scalloped sides forms a point 23 jutting inwardly towards the center of the orifice.

Each scalloped side 22 is an arc of a circle having a lesser diameter than the diameter of an imaginary circle, the circumference of which touches the four jutting points 23. Hereafter in this application an orifice of this design will be characterized as "cloverleaf shaped orifice."

The points 23 only jut inwardly towards the center of the orifice a distance of approximately 5-10% of the diameter of an imaginary circle having a circumference which would pass through points C, D, E, and F. Therefore the orifice is an opening of almost circular cross-section.

The undersurface 13 of the deflection head 8 is composed of a conical shaped undersurface 24 and an annular chamber 25. The annular chamber 25 is formed around the valve stem 7 below the conical shaped undersurface 24. When the water initially passes through the nozzle it emerges through the orifice 4 and fills this chamber 25. The water filled chamber will then act as a deflecting surface, which serves to minimize both the turbulence and friction between the waterflow and the deflecting surface.

The passage of water through an orifice possessing four points evenly spaced as illustrated in FIG. 2 would result in a square spray pattern. The square pattern would be produced as follows:

The water column flowing through the clover-leaf orifice takes the shape of the orifice with four depressions and four projections or crests. On striking the deflection surface the depressions and crests are deformed and fly radially outwards. As they are deformed adjacent crests will collide at the midline of the original depressions and form their own crests to fly radially outwards and form the corners of a square spray pattern.

The number of points in the orifice will vary depending on the pattern of the surface area of the lawn to be sprayed with water. The number of jutting points need not necessarily be four as illustrated in FIG. 2. For example, the passage of water through an orifice possessing three points evenly spaced would result in a triangular spray pattern.

By using the clover-leaf shaped orifice, which is substantially circular it can be readily seen that area of the undersurface of the deflection head required to deflect the same column of water issuing through the nozzle is less than that required with a square orifice. The reason being that the area of a circle transcribed in a square is less than the area of the square itself. Due to the decreased area of the undersurface of the deflection head the friction between the deflection head and the deflecting water is decreased and the deflected water will have more radial velocity than would be possible with a deflection head having a larger undersurface area. As a result a larger area of lawn will be sprayed.

The clover-leaf shaped orifice also has the advantage over a complete circular orifice in that it sprays a square rather than a circular pattern. The square pattern avoids the overlapping of water spray which is necessary if the same area is to be sprayed from water issuing from a circular orifice.

The clover-leaf shaped orifice also has the advantage that it can provide a precise pattern even though the amount of the opening between the top of the casing of the nozzle and the deflection head is varied from a small to a large opening.

FIG. 4 shows another embodiment of a deflection head 8' in which is provided two concentric annular chambers 25' and 26. In this case the second chamber 26 also fills with water and gives an added reduction of friction. It has been found that the addition of a second annular chamber in the deflection head will increase the area of coverage and reduce misting.

FIGS. 5 and 6 illustrate an alternative form of construction for the orifice. The orifice 30 is formed in the upper end of the cylindrical casing 32 with four concavely curved surfaces 33, 34, 35 and 36. The concavely curved surfaces are formed in the same manner as described and illustrated with respect to FIG. 2. However, in this embodiment the four inwardly jutting points 37 of the orifice 30 are tapered ends of four pins 38 inserted slightly through the casing 32. Each pin 38 is inserted in the casing 32 in such a manner that its point 37 is in line with the intersection of two concavely curved surfaces and parallel with the axis of the casing 32. Each of the four pins 38 are secured in place by a set screw 39. When the orifice is constructed in this manner it is a simple operation to change the shape of the orifice and thus the spray pattern. When all the pins are retracted within the casing, the orifice is round and the resulting spray pattern would also be round. By adjusting the pins various spray patterns may be obtained. For example, if two pins were retracted and two pins left projecting into the annular opening in the casing, a half round and a half spray pattern would result.

FIG. 7 illustrates a further variation in the spray nozzle of this invention. A nozzle of the type illustrated in FIG. 7 is adapted to be placed at the edge of the lawn to provide a spray pattern from the edge of the lawn inwards. In this nozzle the casing 42 is given an orifice 43 which is one half of a full orifice as illustrated and designated 4 in FIG. 2. A one half valve stem 44 containing a deflection head 45 adapted to co-operate with the orifice 43 is mounted in the casing by any suitable means, such as a press fit. The portion of the deflection head above the orifice 43 has an undersurface which is composed of a half conical shaped undersurface 47 and a semi-annular chamber 48.

A sprinkler nozzle of the nature disclosed herein will increase the area of coverage for the same water flow. It is also possible to use a nozzle according to this invention to spray less than one half inch per hour with substantially less water flow than is possible on the same area with nozzles now in use.

While there has been illustrated and described preferred embodiments of the present invention, it will be understood by those skilled in the art that various modifications may be made therein without departing from the spirit and scope of the invention.

I claim:

1. A sprinkler nozzle comprising:

- (a) a casing;
- (b) an at least partially, clover-leaf shaped orifice in one end of said casing;
- (c) a valve stem extending through said orifice and being mounted in said casing; and
- (d) a deflection head integral with said valve stem and overlying the end of said casing containing the clover-leaf shaped orifice in such a manner so as to cooperate with said clover-leaf shaped orifice to deflect water coming through said orifice;
- (e) said at least partially clover-leaf shaped orifice being operable to direct liquid flowing therethrough generally against said deflection head, with the deflection of said liquid by said deflection head being operable to form a spray pattern having a generally and at least partially polygonal periphery.

2. A sprinkler nozzle according to claim 1 further comprising:

generally annular chamber means formed in said deflection head surrounding said valve stem, and positioned generally in the path of liquid flowing through said at least partially clover-leaf shaped orifice and toward said deflection head, said chamber means being operable to contain a body of liquid; and a spray patterned-defining outlet defined at least in part by said deflection head, disposed contiguous with and

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in substantially unimpeded fluid communication with said chamber means;

said at least partially, clover-leaf shaped orifice being operable to transmit a flow of said liquid against said body of liquid contained in said chamber means, with said body of liquid in said chamber means being operable, with relatively low frictional impedance, to deflect fluid flowing through said orifice directly into said outlet means.

3. A sprinkler nozzle according to claim 1 further comprising:

two concentric annular chambers formed in said deflection head, surrounding said valve stem, and positioned generally in the path of liquid flowing through said at least partially clover-leaf shaped orifice and toward said deflection head, said annular chambers each being operable to contain a body of liquid; and

a spray patterned-defining outlet defined at least in part by said deflection head, disposed contiguous with and in substantially unimpeded fluid communication with said annular chambers;

said at least partially, cover-leaf shaped orifice being operable to transmit a flow of said liquid against said bodies of liquid contained in said annular chambers, with said bodies of liquid in said annular chambers being operable, with relatively low frictional impedance, to deflect fluid flowing through said orifice directly into said outlet means.

4. A sprinkler nozzle as defined in claim 1 wherein: said orifice in said one end of said casing has scalloped sides which intersect to form inwardly jutting points towards the centre of said orifice, with each such scalloped side being an arc of a circle of lesser diameter than a diameter of an imaginary circle, the circumference of which touches said jutting points; and

said deflection head completely closes one half of said orifice and overlies the other half of said orifice in such a manner so as to cooperate with said orifice to deflect water coming through said orifice.

5. A sprinkler nozzle according to claim 4 further comprising:

at least one semi-annular chamber formed in the half of said deflection head overlying said orifice and disposed directly above the half of said orifice not closed by the deflection head; and

a spray patterned-defining outlet defined at least in part by said deflection head, disposed contiguous with and in substantially unimpeded fluid communication with said semi-annular chamber;

said scalloped sided orifice being operable to transmit a flow of liquid against a body of said liquid contained in said chamber, with said body of liquid in said chamber being operable, with relatively low frictional impedance, to deflect fluid flowing through said orifice directly into said outlet means.

6. A sprinkler nozzle comprising:

(a) a casing;

(b) an orifice in one end of said casing having scalloped sides which intersect to form inwardly jutting points towards the centre of said orifice, each scalloped side being an arc of a circle of lesser diameter than a diameter of an imaginary circle, the circumference of which touches said jutting points;

(c) a valve stem extending through said orifice and being mounted in said casing; and

(d) a deflection head integral with said valve stem and overlying the end of said casing containing said orifice in such a manner so as to co-operate with said orifice to deflect water coming through said orifice;

(e) said scalloped-sided orifice being operable to direct liquid flowing therethrough generally against said deflection head, with the deflection of said liquid by said deflection head being operable to form a spray pattern having a generally and at least partially polygonal periphery.

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7. A sprinkler nozzle according to claim 6 further comprising:

generally annular chamber means formed in said deflection head, surrounding said valve stem, and positioned generally in the path of liquid flowing through said scalloped-sided orifice and toward said deflection head, said chamber means being operable to contain a body of liquid; and

a spray patterned-defining outlet defined at least in part by said deflection head, disposed contiguous with and in substantially unimpeded fluid communication with said chamber means;

said scalloped-sided orifice being operable to transmit a flow of said liquid against said body of liquid contained in said chamber means, with said body of liquid in said chamber means being operable, with relatively low frictional impedance, to deflect fluid flowing through said orifice directly into said outlet means.

8. A sprinkler nozzle according to claim 6 further comprising:

two concentric annular chambers formed in said deflection head, surrounding said valve stem, and positioned generally in the path of liquid flowing through said scalloped-sided orifice and toward said deflection head, said annular chambers each being operable to contain a body of liquid; and

a spray patterned-defining outlet defined at least in part by said deflection head, disposed contiguous with and in substantially unimpeded fluid communication with said annular chambers;

said scalloped-sided orifice being operable to transmit a flow of said liquid against said bodies of liquid contained in said annular chambers, with said bodies of liquid in said annular chambers being operable, with relatively low frictional impedance, to deflect fluid flowing through said orifice directly into said outlet means.

9. A sprinkler nozzle comprising:

a deflection head;

at least partially annular chamber means formed in said deflection head and positioned generally in the path of liquid flowing toward said deflection head, said chamber means being operable to contain a body of liquid;

a spray patterned-defining outlet defined at least in part by said deflection head, disposed contiguous with and in substantially unimpeded fluid communication with said chamber means; and

orifice means operable to transmit a flow of said liquid against said body of liquid contained in said chamber means, with said body of liquid in said chamber means being operable, with relatively low frictional impedance, to deflect fluid flowing through said orifice means directly into said outlet means.

10. A sprinkler nozzle comprising:

(a) a casing;

(b) an annular opening in one end of said casing adapted to form an orifice;

(c) pins with tapered ends projecting slightly into said annular opening, said tapered ends being parallel with the axis of said casing and jutting inwardly towards the centre of said opening to give said opening a scalloped effect;

(d) a valve stem extending through said annular opening and being mounted in said casing; and

(e) a deflection head integral with said valve stem and overlying the end of said casing containing said annular opening in such a manner so as to cooperate with said opening to deflect water coming through said opening;

(f) said scallop-effect opening being operable to direct liquid flowing therethrough generally against said deflection head, with the deflection of said liquid by said deflection head being operable to form a spray

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pattern having a generally and at least partially polygonal periphery.

11. A sprinkler nozzle according to claim 10 further comprising:

generally annular chamber means formed in said deflection head surrounding said valve stem, and positioned generally in the path of liquid flowing through said scallop-effect opening and toward said deflection head, said chamber means being operable to contain a body of liquid; and

a spray patterned-defining outlet defined at least in part by said deflection head, disposed contiguous with and in substantially unimpeded fluid communication with said chamber means;

said scallop-effect opening being operable to transmit a flow of said liquid against said body of liquid contained in said chamber means, with said body of liquid in said chamber means being operable, with relatively low frictional impedance, to deflect fluid flowing through said opening directly into said outlet means.

12. A sprinkler nozzle according to claim 10 further comprising:

two concentric annular chambers formed in said deflection head, surrounding said valve stem, and positioned generally in the path of liquid flowing through said scallop effect opening and toward said deflection head, said annular chambers each being operable to contain a body of liquid; and

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a spray patterned-defining outlet defined at least in part by said deflection head, disposed contiguous with and in substantially unimpeded fluid communication with said annular chambers;

said scallop-effect opening being operable to transmit a flow of said liquid against said bodies of liquid contained in said annular chambers, with said bodies of liquid in said annular chambers being operable, with relatively low frictional impedance, to deflect fluid flowing through said opening directly into said outlet means.

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U.S. Cl. X.R.

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