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3,080,123

IRRIGATION SPRINKLER

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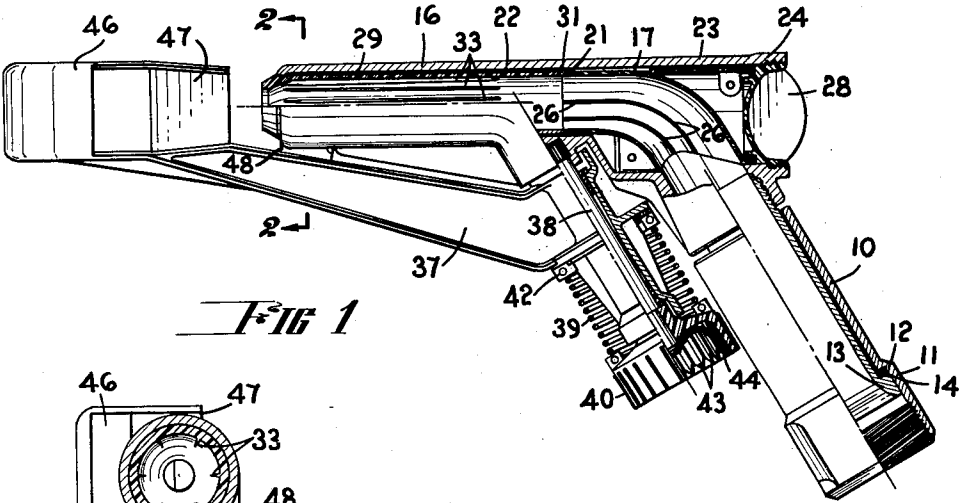


FIG 1

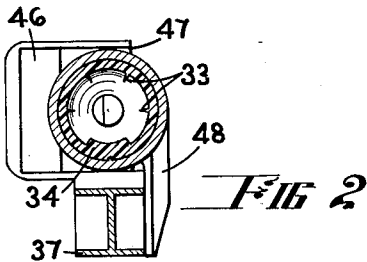


FIG 2

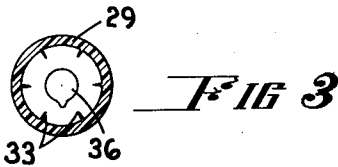


FIG 3

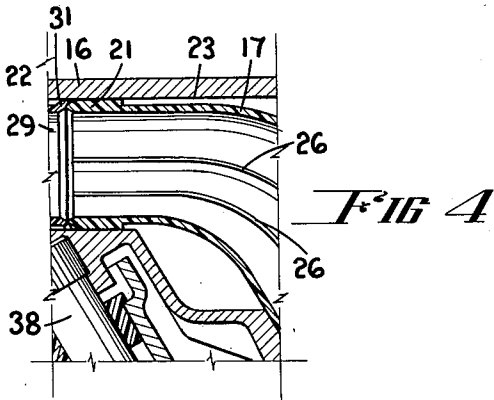


FIG 4

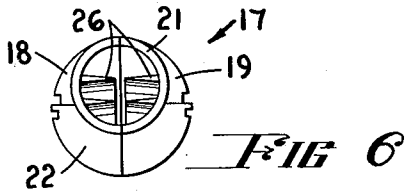


FIG 5

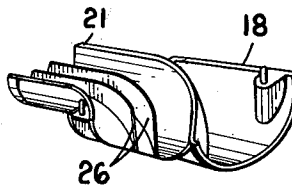


FIG 6

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IRRIGATION SPRINKLER

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10 Claims. (Cl. 239-230)

This invention relates to an improved sprinkler adapted for use in irrigating large areas.

The present common design of irrigation sprinklers comprises a rotatable spout on a hollow tubular stem, the rotatable spout being inclined upwardly, usually on an angle at about 30 degrees, and being adapted to send a thin stream of water outwardly, the thin stream of water being effective in watering an annular area surrounding the sprinkler, and in order to water the space within the annular area, it is usual to utilise a secondary nozzle which intermittently impinges against a deflector plate of a spring-loaded arm in such a way that the arm oscillates about an axis, and the inertia of the arm when under the influence of the spring is effective in rotating the rotatable spout in small increments.

The usual existing design of the type described above is inefficient, one cause of inefficiency being excessive break-up of the thin stream and consequent sensitivity to wind influence. Quite clearly if the distribution of the commonly used two nozzles can be obtained from one single nozzle, the break-up can be reduced considerably, reductions can be made in internal flow resistance, and economies achieved in production of a sprinkler.

A second cause of inefficiency is the energy loss due to turbulence within the stem and spout, much of this turbulence resulting from spiralling of the water within the spout caused by change of direction.

In its simplest form an irrigation sprinkler according to this invention comprises tubular support means, a spout on the discharge end of the tubular stem disposed at an angle thereto, an elbow insert within the spout, said elbow insert of streamline shape and communicating at its inlet end with the discharge end of the tubular stem and communicating at its outlet end with the spout, and inwardly disposed fins within the elbow extending in the direction of the path of liquid flow.

By utilising the single spout, droplet size is increased thereby increasing possible throw and the inwardly finned elbow in having its fins extending in the direction of the path of fluid flow ensures a smooth non-spiralling flow through the sprinkler, with a minimum of turbulence.

An embodiment of the invention is described hereunder in some detail with reference to and is illustrated in the accompanying drawings, in which:

FIG. 1 is a partly sectioned elevation of a sprinkler,

FIG. 2 is a section on lines 2-2 of FIG. 1,

FIG. 3 is a section illustrating an alternative nozzle arrangement,

FIG. 4 is an enlarged sectional view showing the junction between the elbow insert and the nozzle insert,

FIG. 5 is a perspective view of one half the elbow insert, and

FIG. 6 is a front view of the elbow insert.

According to this embodiment a hollow tubular stem 10 of metal is shaped with a bend of about 30 degrees to achieve a good condition for throw of a stream of water. The hollow tubular stem 10 is rotatable within tubular support means constituted by a ferrule 11, the ferrule having an inwardly disposed annular shoulder 12 which co-operates with an outwardly disposed annular shoulder 13 on the inlet end of the hollow tubular stem, and a sealing washer 14 is disposed between the two

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shoulders, the sealing washer 14 being under compression when water pressure is applied to the sprinkler, this feature being in accordance with normal practice.

The stem 10 communicates with a spout 16, inclination of the spout 16 from the tubular stem 10 being about a radius of the order of one inch along the axial line, and a plastic elbow insert 17 is fitted into the elbow portion, the plastic insert 17 being formed in two halves 18 and 19 placed face to face to form an assembly (see FIGS. 5 and 6). The assembly of the two halves 18 and 19 comprise two non-coaxial cylindrical portions, the front cylindrical portion 21 engaging within the bore of the spout 16, and the rear cylindrical portion 22 engaging in a complementary bore 23 of the rear extension 24 of the spout 16. Each of the halves 18 and 19 has within it a pair of inwardly disposed fins 26 which follow exactly the path of flow of fluid passing through the insert 17.

The edges of the fins 26 are displaced from each other by a short distance in order to reduce interference by the fins with the flow of solid substances such as grass, feathers or algae. It is known that there is normally a tendency for the water passing at high speed through an elbow to circulate in a form of double circular pattern, and the fins prevent this circulation, thereby preventing dissipation of energy and limiting the non-axial component of motion which tends to break up the stream of water. The plastic elbow insert 17 is fitted into the spout 16 through an aperture in the end of the rear extension 23, the aperture subsequently being closed with a closure member 28. The insert 17 has a substantial length projecting into the bore 22 of the spout 16, in this embodiment being about three-quarters of an inch, so that axial alignment with the plastic nozzle insert 29 is assured.

The rotatable spout itself comprises a metal member into which is fitted the plastic nozzle insert 29, the nozzle insert 29 aligning with the elbow insert 17 by means of the mating tapered faces 31 so that no sudden break of diameter occurs, but the diameter gradually decreases following a contour of the type recommended for nozzles.

The inner surface of this nozzle insert 29 is provided with a plurality of spaced radial fins 33 extending in for a short distance to guard against the possibility of development of any rotational component of motion of liquid, the fins gradually increasing in depth towards the discharge end (see FIG. 1). The nozzle is made non-circular by any one of a number of means, in this embodiment by closing the space 34 between one pair of inwardly disposed radial fins (see FIG. 2). This provides a ramp of gradually increasing depth towards the discharge end. In this manner all the water is discharged from a single spout, the non-circular portion of the nozzle assuring a more even distribution of water around the inner circle which is not watered by the main stream.

FIG. 3 shows a slight variation from this embodiment wherein the non-circular form is achieved by a pear-shaped hole 36 at the outlet end of the nozzle insert 29.

A spring-loaded arm 37 is mounted on a shaft 38 extending downwardly parallel to but spaced from the hollow tubular stem 10, the arm 37 being rotatable on the shaft and being engaged by one end of a helical wire spring 39, the other end of the wire spring engaging a non-metallic adjusting knob 40 which is rotatable in increments on the end of the shaft 38. The upper end of the wire spring contacts a non-metallic sleeve 42 in order to prevent galvanic deterioration of the spring. The adjusting knob 40 is formed hollow, and the inner cylindrical surface is serrated with somewhat large serrations 43 which are engaged by a shaped leaf spring 44 retained non-rotationally on the end of the shaft 38.

The forward end of the arm 37 terminates in a bucket

46 disposed forwardly and spaced from a deflector plate 47 which is in alignment with the nozzle insert 29 when the arm 37 contacts the depending stop 48 on the spout 16, so that the arm 37 is deflected intermittently by a stream of water issuing from the nozzle insert 29 but returned by the spring 39 to urge rotation of the spout 16 relative to the ferrule 11, which of course is adapted to be secured to a standpipe or the like.

A consideration of the above embodiment will indicate that the sprinkler may be made in such a way as to produce a spray which results in satisfactory distribution without excessive misting. The finned plastic elbow inserts are self-centering in the upstream end of the nozzle and the joint is kept under elastic pressure, this being achieved by the mating of tapered ends, and resulting in an ideal joint without any disturbance to the flow. The nozzle and elbow inserts can be readily removed through the opening at the rear end of the spout without the need for special tools, and are so arranged that they cannot be assembled incorrectly. In this manner the elbow halves and nozzle can be regarded as cartridges which are quickly inserted in the sprinkler and may be readily replaced if this is necessary or quickly withdrawn for cleaning purposes.

It will be seen that the underslung spring-loaded oscillating arm is readily adjustable and is positioned where it is less likely to be affected by sand and dust than the usual existing arm.

What I claim is:

1. An irrigation sprinkler comprising tubular support means, a hollow tubular stem rotatable on the tubular support means, a spout on the discharge end of the tubular stem disposed at an angle thereto, a nozzle insert within the spout, the inner diameter of said nozzle insert gradually decreasing towards its discharge end, a plurality of inwardly disposed axially extending fins in said nozzle gradually increasing in depth towards its discharge end and terminating adjacent said discharge end, an elbow insert within said spout, said elbow insert of streamline shape and communicating at its inlet end with the discharge end of the tubular stem and communicating at its outlet end with the nozzle insert, and inwardly disposed fins within the elbow extending in the direction of the path of liquid flow.

2. An irrigation sprinkler comprising tubular support means, a hollow tubular stem rotatable on the tubular support means, a spout on the discharge end of the tubular stem disposed at an angle thereto, a nozzle insert within the spout, the inner diameter of said nozzle insert gradually decreasing towards its discharge end, a plurality of inwardly disposed axially extending fins in said nozzle terminating adjacent said discharge end, a rearward extension on the spout, an elbow insert within the rearward extension of the spout, said elbow insert of streamline shape and communicating at its inlet end with the discharge end of the tubular stem and communicating at its outlet end with the nozzle insert, inwardly disposed fins within the elbow extending in the direction of the path of liquid flow, said elbow insert comprising two halves joined face to face, and a closure member in the rearward extension sealably retaining said elbow insert therein.

3. An irrigation sprinkler comprising tubular support means, a hollow tubular stem rotatable on the tubular support means, a spout on the discharge end of the tubular stem disposed at an angle thereto, a nozzle insert in the spout, a rearward extension on the spout, the bore of the rearward extension of greater diameter than the bore of the spout and communicating therewith, an elbow insert within the rearward extension, said elbow insert of streamline shape and communicating at its inlet end with the discharge end of the tubular stem and communicating at its outlet end with the nozzle insert, the inner diameter of the inlet end of said nozzle insert and the inside diameter of the discharge end of said elbow being identical, inwardly disposed fins within the elbow

extending in the direction of the path of liquid flow, inwardly disposed fins within the nozzle also extending in the direction of the path of liquid flow and gradually increasing in depth towards the discharge end of said nozzle and terminating adjacent said discharge end, and a closure member in the rearward extension sealably retaining said nozzle insert and said elbow insert within the spout and rearward extension respectively.

4. An irrigation sprinkler comprising tubular support means, a hollow tubular stem rotatable on the tubular support means, a spout on the discharge end of the tubular stem disposed at an angle thereto, a nozzle insert within the spout, the inner diameter of said nozzle insert gradually decreasing towards its discharge end, a plurality of inwardly disposed axially extending fins in said nozzle terminating adjacent said discharge end, an elbow insert within the spout, said elbow insert of streamline shape and communicating at its inlet end with the discharge end of the tubular stem and communicating at its outlet end with the inlet end of said nozzle insert, inwardly disposed fins within the elbow extending in the direction of the path of liquid flow, a shaft extending downwardly from the spout, a spring-loaded arm oscillatable on the shaft, a deflector plate and bucket on the swinging end of the arm and in the path of liquid when issuing from the spout, and a spring adjustment nut on the shaft.

5. An irrigation sprinkler comprising a tubular ferrule, a hollow tubular stem rotatable within the ferrule, a spout on the discharge end of the tubular stem disposed at an angle thereto, a nozzle insert within the spout, the inner diameter of said nozzle insert gradually decreasing towards its discharge end, a plurality of inwardly disposed axially extending fins in said nozzle gradually increasing in depth towards its discharge end and terminating adjacent said discharge end, an elbow insert within a rearward extension of the spout contiguous at one end with the tubular stem and at the other end with the nozzle insert, the inside diameter of the elbow insert being identical with the inside diameter of the elbow insert where they contact, said elbow insert comprising two separable halves joined face to face, a removable closure member on the rearward extension retaining the elbow and the nozzle in end to end relationship for fluid flow therethrough, and internal fins in each half elbow extending in the path of fluid flow, the edges of the fins in the elbow halves being displaced apart whereby liquid may pass at high velocity from the tubular stem, through the elbow and nozzle insert without spiralling.

6. An irrigation sprinkler comprising a tubular ferrule, a hollow tubular stem rotatable within the ferrule, a spout on the discharge end of the tubular stem disposed at an angle thereto, a nozzle insert within the spout, the inner diameter of said nozzle insert gradually decreasing towards its discharge end, a plurality of inwardly disposed axially extending fins in said nozzle terminating adjacent said discharge end, an elbow insert within a rearward extension of the spout communicating at one end with the tubular stem and at the other end with the nozzle insert, tapered mating faces between the nozzle and elbow inserts, a removable closure member on the rearward extension retaining the elbow and the nozzle in end to end relationship for fluid flow therethrough, internal fins within the elbow extending in the path of fluid flow whereby liquid may pass at high velocity from the tubular stem, through the elbow and nozzle insert without spiralling, the space between the lowermost pair of adjacent fins within the nozzle insert being closed whereby liquid issuing from the nozzle will cover a sector of a circular area substantially evenly.

7. An irrigation sprinkler comprising a tubular ferrule, a hollow tubular stem rotatable within the ferrule, a spout on the discharge end of the tubular stem disposed at an angle thereto, a nozzle insert within the spout, the inner diameter of said nozzle insert gradually decreasing

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towards its discharge end, a plurality of inwardly disposed axially extending fins in said nozzle terminating adjacent said discharge end, an elbow insert within a rearward extension of the spout communicating at one end with the tubular stem and at the other end with the nozzle insert, tapered mating faces between the nozzle and elbow inserts, a removable closure member on the rearward extension retaining the elbow and the nozzle in end to end relationship for fluid flow therethrough, internal fins within the elbow extending in the path of fluid flow whereby liquid may pass at high velocity from the tubular stem, through the elbow and nozzle insert without spiralling and without traversing sudden variations of inside diameter, the space between the lowermost pair of adjacent fins within the nozzle being closed whereby liquid issuing from the nozzle will cover a sector of a circular area with a substantially even cover, and a loaded arm oscillatable on a shaft on the spout operable to urge incremental rotation of the spout relative to the ferrule.

8. An irrigation sprinkler comprising a tubular ferrule, a hollow tubular stem rotatable within the ferrule, a spout on the discharge end of the tubular stem disposed at an angle thereto, a nozzle insert within the spout, the inner diameter of said nozzle insert gradually decreasing towards its discharge end, a plurality of inwardly disposed axially extending fins in said nozzle terminating adjacent said discharge end, an elbow insert within a rearward extension of the spout communicating at one end with the tubular stem and at the other end with the nozzle insert, a removable closure member on the rearward extension retaining the elbow and the nozzle in end to end relationship for fluid flow therethrough, internal fins within the elbow extending in the path of fluid flow whereby liquid may pass at high velocity from the tubular stem, through the elbow and nozzle insert without spiralling, the outlet aperture of the nozzle insert, the walls of the outlet aperture having a centrally disposed downward extension whereby it is substantially pear shaped whereby liquid in issuing from the nozzle will cover a sector of a circular area substantially evenly.

9. An irrigation sprinkler comprising a tubular ferrule, a hollow tubular stem rotatable within the ferrule, a spout on the discharge end of the tubular stem disposed at an angle thereto, a nozzle insert within the spout, the inner diameter of said nozzle insert gradually decreasing towards its discharge end, a plurality of inwardly disposed axially extending fins in said nozzle terminating adjacent said discharge end, an elbow insert in the spout communicating at its upstream end with the upper end of the hollow tubular stem and at its downstream end with the upstream end of the nozzle insert, the inside diameter of the downstream end of the nozzle insert being identical with the inside diameter of the upstream end

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of the elbow insert, tapered mating surfaces between the elbow and nozzle inserts, a closure member in the end of the rearward extension urging the tapered mating surfaces into close contact with one another, fins in the elbow insert extending in the direction of liquid flow, a shaft depending from the spout, an arm oscillatable on the shaft, a deflector plate and a bucket on the swinging end of the arm in the path of liquid issuing from the nozzle, a non-metallic sleeve on the arm, a non-metallic adjusting nut on the end of the shaft, and a helical return spring between said sleeve and adjusting nut urging the arm into contact with the spout with a force dependent upon the positioning of the adjusting nut.

10. An irrigation sprinkler comprising a tubular ferrule, a hollow tubular stem rotatable within the ferrule, a spout on the discharge end of the tubular stem disposed at an angle thereto, a rearward extension on the spout, the bore of the rearward extension being of larger diameter than the bore of the spout and being parallel thereto and communicating therewith, a nozzle insert in the spout insertable therinto or removable therefrom through said rearward extension, internal radially spaced fins in the nozzle insert gradually increasing in depth toward and terminating adjacent the discharge end of the nozzle, the space between the lowermost pair of adjacent fins being closed whereby liquid in issuing from said spout is asymmetrical about a horizontal axis, an elbow insert in the rearward extension communicating at its upstream end with the upper end of the hollow tubular stem and at its downstream end with the upstream end of the nozzle, tapered mating surfaces between the elbow and nozzle inserts, a closure member in the end of the rearward extension urging the tapered mating surfaces into close contact with one another, said elbow insert comprising two halves, fins in each half extending in the direction of liquid flow, a shaft depending from the spout, an arm oscillatable on the shaft, a deflector plate and a bucket on the swinging end of the arm in the path of liquid issuing from the nozzle, a non-metallic sleeve on the arm, a non-metallic adjusting nut on the end of the shaft, and a helical return spring between said sleeve and adjusting nut urging the arm into contact with the spout.

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