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ROTATABLE SPRINKLERS

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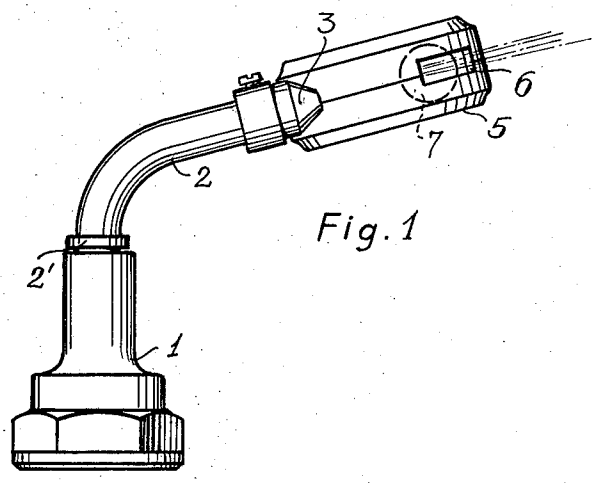


Fig. 1

Fig. 2

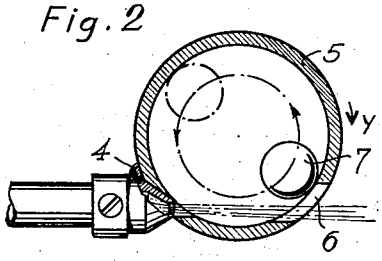


Fig. 4

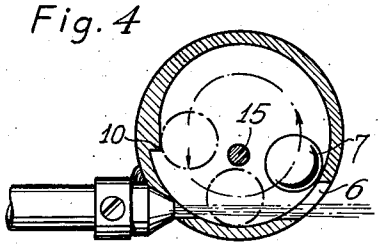


Fig. 3

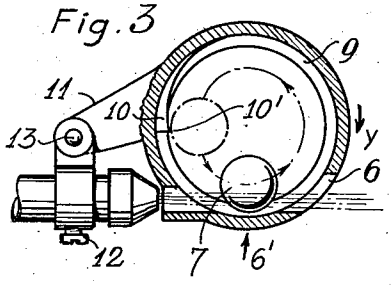
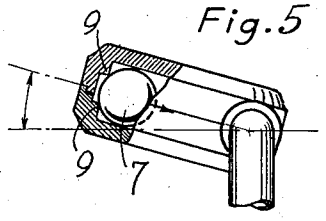


Fig. 5



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ROTATABLE SPRINKLERS

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The present invention relates to irrigation devices and more particularly to rotatable sprinkler heads for such purpose.

A great variety of such sprinkler heads is known in the trade. The power for their drive is derived from the prevailing water pressure. They are usually of two types: One type is working on the principle of "Barker's wheel," i.e. on "reaction," while in the other type a swingable spring-biassed weight is used. This latter is deflected from its position of rest by the impinging water jet ejected from the nozzle, and returns to its former position under the urge of a spring and, possibly, its weight. At the end of this return movement it strikes the turnable arm of the device, or a part integral therewith, with a certain force, so that the arm is turned by the impact through a small angle. As such deflection and return motion repeats itself rhythmically the device is slowly and stepwise rotated. Although such stepwise movement is desirable, the necessity of providing a spring and a bracket, or hinge, for the swinging weight is a drawback, making the device costly and unreliable. Other devices, provided with a propeller or impeller vanes and a toothed gear, are still more costly and complicated.

It is the object of this invention to provide a sprinkler which also functions on the impact principle which, however, does not employ springs, hinged parts and swinging masses.

It is a further object of the invention to provide a sprinkler which is simple in construction and reliable and foolproof in use.

Finally it is an object of the invention to produce a sprinkler at low cost.

According to the invention, there is provided a sprinkler head, to be fitted rotatably on a riser, comprising a cage having at least an inlet and an outlet opening in its circumference, a freely movable ball or other rounded body, such as a cylinder, being enclosed therein, a circular, oval, or elliptic path being provided in the cage for the said body, the cage being connected to a tubular arm in a position slightly inclined to the horizontal, the said arm ending in a nozzle which latter faces the said inlet to direct a water jet substantially tangentially into said cage at the lowest portion of the latter, the other end of the arm being so designed that it can be turnably fitted to the end of a riser, the arrangement being such that the water jet emanating from the nozzle will pass freely through the cage and, on striking the ball, will force the latter to roll along the circumferential wall of the cage for a certain distance, thus escaping from the jet and then to roll back to the initial position of rest, to re-enter the jet and to be pushed by the jet against the wall of the cage so as to strike it, thereupon recommencing the sequence of said movements, thus striking the wall rhythmically and thereby turning the sprinkler-head step by step with every strike.

In a preferred embodiment a race-like guideway for the ball is provided within the cage.

In still another embodiment a deflector is provided in the path of the ball thereby that the guideway is curved slightly towards the interior of the cage and ends abruptly some distance from the wall, so as to force the ball to abandon its substantially circular path near or at the lowest point of the cage and to strike the wall of the cage still more forcefully at a point at the end of the deflector.

According to yet another important feature of the invention, means are provided positively forcing the rolling body into the jet whenever the body is about to re-enter the path of the jet.

This and other features of the new sprinkler head will become clear from the following detailed description in connection with the drawings, showing in

FIGURE 1 the new device in a schematical side elevation.

FIGURE 2 is a plan view thereof, partially in section.

FIGURE 3 is a similar view of a modified form.

FIGURE 4 is a view similar to that of FIGURE 2 and illustrating a special feature of the invention.

FIGURE 5 is a fractional rear view of FIGURE 1, partly in section.

In a nipple **1** is turnably inserted a bent tube **2**, its lower, downwardly extending end **2'** being turnable, but water-tightly held in the nipple **1**. The upper portion of tube **2** extends upwardly and radially in relation to the nipple and ends in a nozzle **3**. To said nozzle is welded at **4** (see FIGURE 2) a flat, cylindrical cage **5** in such a manner that the axis of the nozzle is directed towards the interior of the cage in a way that the axis of the nozzle is substantially tangential to the cage. Cage **5** has a slot **6** in its circumference permitting free passage for a water jet emanating from nozzle **3**. Such a jet (see FIGURES 2 and 3) will thus pass, for a short distance, through the cage near its circumference. Within the cage **5** is located and freely movable a steel ball **7** of a diameter substantially equal to the height of the flat cylinder forming cage **5**. When the ball is struck by the jet, it will be driven within the cage along its circumference in the direction of the arrows (FIGURES 2, 3, and 4) in a substantially circular path. The ball will be carried by the force of the jet to a distance which depends on the weight of the ball and the velocity of the jet. When the force acting on the ball is spent, the circular movement of the ball is at end, and it will roll to the lowest point of the edge where it will re-enter the jet and will be forced by the latter to the wall, striking it approximately at **6'** imparting to the cage and thus to the device a turning movement in the direction of the arrow *y*. Now the ball **7** will be carried further by the water jet and will be again driven around as described, repeating the described movement indefinitely as long as water gushes from the nozzle. In this way the sprinkler head will be turned around stepwise, irrigating a circular area in a well known manner. For this performance even a very small water pressure such as 0.2 to 0.3 atm. will be sufficient, as practical tests have shown. For smoother running two parallel, circular ribs or shoulders **9** may be provided in the cage (see FIGURE 5) to serve as a guide means or race for the ball. To increase the said impact there may be provided, additionally, a deflector **10** as shown in FIGURE 3 directing the rotating ball **7** and forcing it to abandon the circular path, to strike the wall of the cage due to centrifugal motion at a predetermined point, at which the ball re-enters the jet.

The deflector is a rib, curving towards the centre of the cage. It ends abruptly at **10'**; at this point the ball leaves the race with a slight centrifugal motion towards the wall, knocking against the latter.

FIGURE 3 shows, furthermore, an alternative manner of fixing the cage **5** to the arm **2**, by means of a bracket **11** fixed by a set screw **12**. In still another modification a hinge **13** may be provided for adjusting the relative positions of nozzle **3** and cage **5**.

Ordinarily a steel or copper ball will be used which, due to its weight, will smoothly re-enter the jet at **6'**. In cases, however, where the ball is either too small or of lighter material, say plastic or rubber, it might not be

heavy enough to re-enter the jet and thus knock onto the wall of the cage. It might be carried on the surface of the water jet. To meet this contingency and to counteract it, a pin 15 (see FIGURE 4) may be provided across the cage at a distance from point 6' which is about equivalent to the diameter of the ball 7. Thus the ball, rolling along the deflector and dropping off at 10' will be caused by the pin 15 to enter the path of the jet and will be forced by it against the wall of the cage.

A number of other modifications would be within the scope of the invention which has been shown and described by way of example only; the cage may have additional openings in its circumference and/or in the top-and-bottom-walls as well. The outline need not be circular, it could be elliptical or oval as well. The inclination to the horizontal can easily be made adjustable. By turning it to the opposite side of the arm, the sense of rotation of the device could be reversed. Instead of a ball a disc, preferably with slightly convex end surface, could be used.

I claim:

1. A rotatable sprinkler comprising a nipple adapted to be connected to a source of water supply, a bent tube rotatably journalled at one end in the end of said nipple, a nozzle connected to the other end of said tube, and means connected to said tube adjacent said nozzle for imparting intermittent angular rotation to said nozzle when water is discharged from said nozzle, said latter means including a cage defining an endless curved path, means for mounting said cage eccentrically in respect to the discharge of said nozzle, and said cage being provided with opposed inlet and outlet openings arranged on a common side of the center of said cage and disposed in axial alignment with said nozzle, said nozzle being arranged to discharge directly into said inlet with the jet emanating from said nozzle flowing straight through said cage through said inlet and outlet openings, said inlet and outlet openings being disposed so that the water jet flowing therethrough flows in a path contiguous to the arcuate wall portion of the cage disposed between said openings, and a rounded body freely movable enclosed within said cage whereby the water jet upon striking said body propels the same around the endless path defined by said cage a predetermined distance for imparting thereto a centrifugal motion to impart to said nozzle an intermittent rotary movement.

2. A device for connection to a conduit, which conduit is pivotally mounted for the discharge of liquid in all angular directions, comprising a disc-shaped hollow cage,

said cage having aligned inlet and outlet openings defined in opposite sides thereof at a spaced location from the center of said cage, a weighted ball in said cage freely rollable therein, said cage having means for connecting it to the conduit in a position to align the inlet and outlet openings in alignment with the liquid flow through the conduit and to incline the cage to cause the ball to roll by gravity to a position within said cage in alignment with said inlet and outlet openings, whereby, when liquid is flowing through said inlet and outlet openings of said cage, it will impart a centrifugal movement to the ball to cause the latter to roll around said cage and cause movement of the conduit around its pivotal mounting.

3. A rotatable sprinkler comprising a nipple adapted to be connected to a source of water supply, a bent tube rotatably journalled at one end in the end of said nipple, a nozzle connected to the other end of said tube, and means connected to said tube adjacent said nozzle for imparting intermittent angular rotation to said nozzle when water is discharged from said nozzle, said latter means including a cage defining an endless curved path, said cage being eccentrically positioned with respect to the discharge of said nozzle, and said cage being provided in opposed inlet and outlet openings disposed in axial alignment with said nozzle, so that when the cage is eccentrically disposed with respect to said nozzle, the jet emanating from said nozzle flows straight through said cage through said inlet and outlet openings, said inlet and outlet openings being disposed so that the water jet flowing therethrough flows in a path contiguous to the arcuate wall portion of the cage disposed between said openings, and a rounded body freely movable enclosed within said cage whereby the water jet, upon striking said body, propels the same around the endless path defined by said cage a predetermined distance for imparting thereto a centrifugal motion, and a clamp member including a bracket portion connected to said cage and a collar portion extending around said bent tube, clamping means on said collar portion for fixing said collar portion in relation to said bent tube, said clamping element being pivotally connected to said collar portion to permit location of the inlet and outlet of said cage in alignment with said nozzle discharge.

References Cited in the file of this patent

UNITED STATES PATENTS

1,742,898	Buelna	Jan. 7, 1930
1,919,243	Munz	July 25, 1933
2,086,515	Evans	July 6, 1937