Nov. 29, 1938. K. L. LANNINGER 2,138,282

ROTATING SPRINKLER

Filed April 3, 1936

Fig. 1

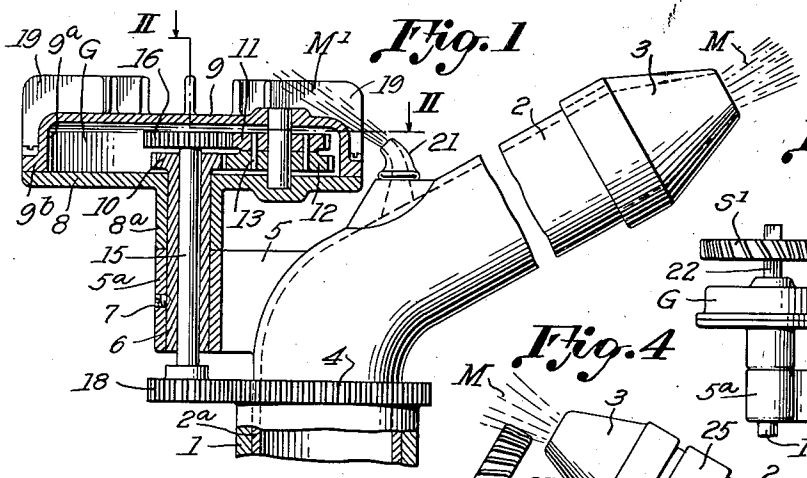


Fig. 3

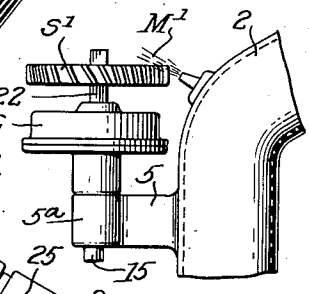


Fig. 4

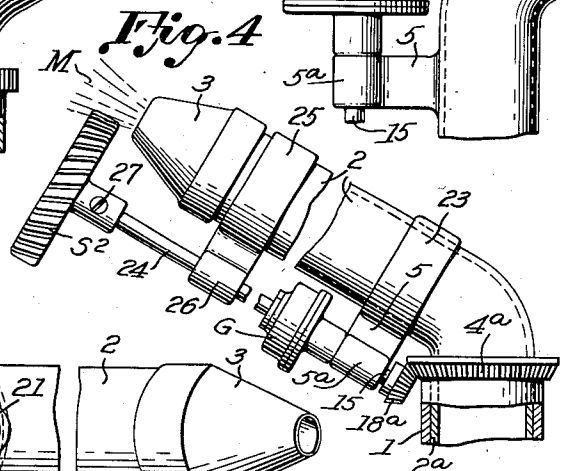


Fig. 2

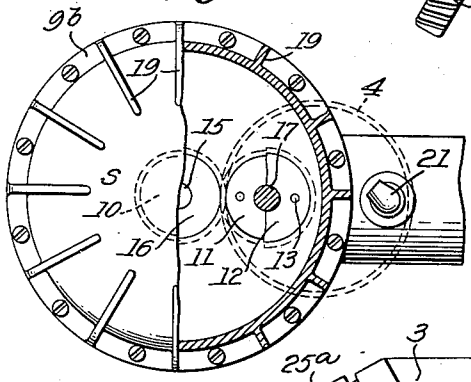


Fig. 5

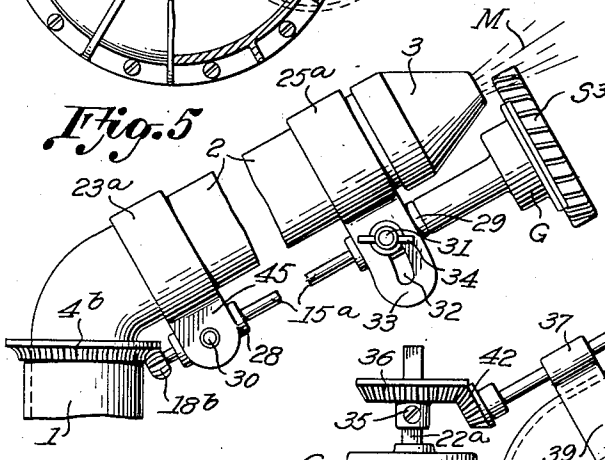
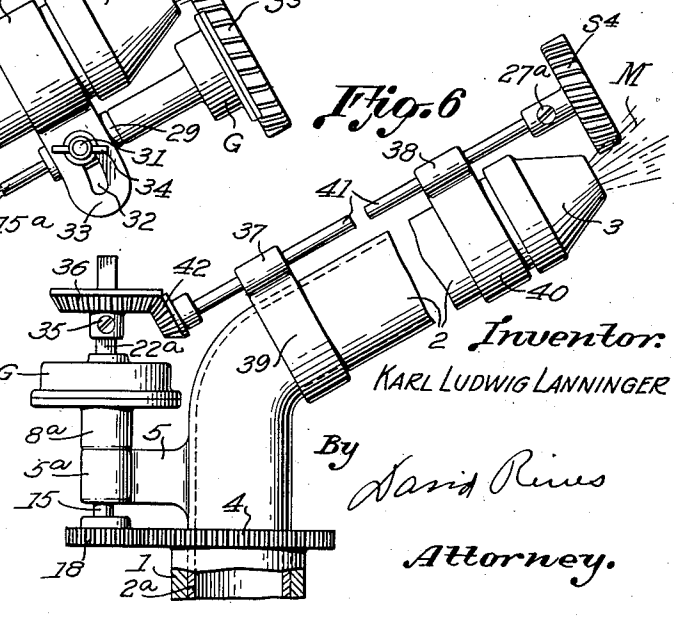


Fig. 6



Inventor:
KARL LUDWIG LANNINGER
By David Rines
Attorney.

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ROTATING SPRINKLER

Karl Lüdwig Lanninger, Frankfort-on-the-Main-Rodelheim, Germany

Application April 3, 1936, Serial No. 72,559
In Germany April 10, 1935

7 Claims. (Cl. 299—68)

This invention relates to rotating or circulating sprinklers, and more particularly to sprinklers of the long-jet type having a rotatable nozzle tube through which a water jet is ejected over a wide arc. The nozzle tube is customarily mounted rotatably upon a sprinkler tube at an inclination thereto; and its rotation is effected, about the longitudinal axis of the sprinkler tube, by causing the water jet to impinge, directly or indirectly, upon a rotor element, such as a vane wheel or a turbine, that drives a pinion or spur wheel the teeth of which mesh with a crown of teeth mounted upon a fixed hollow or tubular shaft of the sprinkler tube.

In rotating sprinklers of the above-described character, the gearing connections between the rotor and the spur wheel or pinion are quite complex, usually comprising a worm and a worm wheel, with a plurality of longitudinal and transverse shafts, in different planes, requiring the use of a plurality of bearings and a complicated housing or housings.

An object of the invention is to improve and simplify the construction of present-day rotating sprinklers of the above-described character, to the ends of increasing their efficiency and facilitating their operation, particularly for agricultural uses, and reducing their cost of manufacture.

With this and other objects in view, the nature of which will appear from the following description, taken in connection with the accompanying drawing, and as will appear from the claims hereunto annexed, a feature of the invention resides in a circulating differential or epicyclic gear train between the rotor element and the pinion or spur wheel.

Several embodiments of the invention are illustrated by way of example in the accompanying drawing in which:—

Fig. 1 shows the upper part of a circulating sprinkler in side elevation, the circulating gear being shown in section.

Fig. 2 is a top plan view along a section line II—II of Fig. 1.

Fig. 3 shows a second form of construction of the upper part of the sprinkler, in side elevation, in which, as in the first form of construction, a water jet ejected through an auxiliary nozzle of the nozzle tube impinges upon the rotor element; and

Figs. 4, 5 and 6 show in side elevation forms of construction in which the rotor element is actuated by a jet from the nozzle of the sprinkler tube.

The vertical arm 2a of the nozzle tube 2, through the nozzle 3 of which the water jet is ejected, is telescoped in the tube 1 into which the water for sprinkling is forced upward by a pump. A crown of teeth 4 is rigidly fixed on the top end of tube 1. A bearing 5 is cast on the bend of nozzle tube 2 and carries a hub 5a in which a sleeve 6 is fixed against rotation by a headless screw 7. The sleeve 6 carries at its top end a toothed crown 10. A casing G composed of two parts rests on the hub 5a of the bearing 5. The bottom plate 8 of the casing has a hub 8a bearing on the end face of hub 5a. The top plate 9 and the wall 9a of the casing are detachably connected with the bottom plate 8 by means of screws screwed into the flange 8b. A vertical bolt 17 is anchored in the top and bottom plates of casing G and serves as pivot pin for a set of spur wheels 11, 12. These spur wheels, rigidly coupled by pins 13, are of different diameters. The spur wheel 12 meshes with the toothed crown 10 of sleeve 6. In the sleeve 6 a vertical shaft 15 is mounted which carries at its upper end a spur wheel 16 and at its lower end a spur wheel 18, the latter meshing with the stationary crown of teeth 4. The end face of casing G has radial ribs 19 which form a crown of vanes S. The wall of the nozzle tube 2, 2a has near the casing G a projection 20 which is bored and carries an auxiliary nozzle 21, the mouth of which faces the crown of vanes S.

During the operation of the sprinkler water under pressure flows through the tubular shaft 1 and the nozzle tube 2, 2a rotatably mounted in said shaft, the water being ejected in the form of a long jet M from the nozzle 3 of the sprinkler tube. A branch jet M^1 impinges on the crown of vanes S, whereby the casing is rotated together with the hub 8a which turns around sleeve 6 so that the spur wheels 11 and 12 are rotated also. The lower spur wheel 12 rolls on the crown of teeth 10 of the stationary sleeve 6. The upper spur wheel 11 rotates spur wheel 16 and, therefore, the shaft 15 guided in sleeve 6. The spur wheel 18 on the lower end of shaft 15 rolls on the stationary crown of teeth 4, whereby the nozzle tube 2, 2a is rotated in the tubular shaft 1 and the water jet moved along a circle.

By suitable selection of the gears 11, 12, 16 and 18, it is possible to vary the speed of rotation of the casing and of the rolling wheel 18. In the form of construction shown in Figs. 1 and 2 spur wheel 18 is smaller than spur wheel 16 and spur wheel 12 larger than spur wheel 11. The speed of the rolling wheel 18 is therefore reduced relative to that of casing G. In the form of construction shown in Fig. 3 the casing G is mounted

upon a square shaft 22 carrying the crown of vanes S^1 of a turbine on which the branch jet M^1 impinges. The turbine rotates the casing G containing the differential gear and therefore the shaft 15 carrying the rolling wheel 18.

According to the form of construction shown in Fig. 4, the bearing 5, 5a, carrying the casing G and the gearing therein is suspended from the lower side of the sprinkler tube 2 by means of a sleeve 23. Shaft 15 carries at its lower end a rolling wheel consisting of a bevel wheel 18a meshing with a bevelled crown of teeth 4a fixed on the tubular shaft 1. A shaft 24 is mounted on the end face of the casing G and is rotatably guided in a bearing 26 suspended by means of a sleeve 25 from the sprinkler tube 2. On the outer end of shaft 24 a turbine S^2 is mounted within the range of the mouth of the sprinkler nozzle 3, the hub of this turbine being fixed on the shaft 24 by a screw 27.

The water jet M ejected from the nozzle 3 impinges on the turbine S^2 to rotate it. The rotation of the turbine is transmitted to the casing G and the shaft 15 so that the bevel wheel 18a rolls on the crown of bevelled teeth 4a to effect rotation of the sprinkler tube.

The form of construction shown in Fig. 5 is quite similar to that shown in Fig. 4, the gear being suspended on the sprinkler tube.

In this instance the turbine S^3 is directly mounted on the end face of the casing G in such manner that the turbine is located within the range of the water jet M ejected from the nozzle 3 of the sprinkler tube 2. The shaft 15a, carrying a hyperbolically shaped wheel 18b rolling on the crown of teeth 4b, is rotatably mounted in two bushes 28 and 29. The bush 28 is oscillatably mounted by means of studs 30 in lugs 45 of a sleeve 23a. The bush 29 has pins 31 engaging in arcuate slots 32 of flaps 33 of a sleeve 25a mounted on the upper portion of the sprinkler tube. The shaft 15a is thus rendered adjustable relative to the sprinkler tube: by unscrewing the wing nut 34 on the stud 31, and sliding the studs 31 in the arcuate slots 32, the shaft 15a and the casing G and the turbine S^3 carried thereby may be adjusted to a position inclined relative to the longitudinal axis of the sprinkler tube 2. The distance of the turbine from the water jet M may thus be increased so as to decrease the action of the jet M on the turbine.

The form of construction shown in Fig. 6 differs from that shown in Fig. 4 in that the shaft which transmits the rotative movement of the turbine and the casing to the rolling wheel is journaled at the upper side of the sprinkler tube.

The square shaft 22a mounted on the top of casing G carries a bevel wheel 36 fixed by means of a screw 35. A shaft 41 is guided in journals 37, 38 which are held by bands 39, 40 at the upper side of the sprinkler tube 2. The upper end of the shaft 41 is clamped by means of a clamping screw 27a to the lower side of the turbine S^4, and the lower end of the shaft 41 is provided with a bevel wheel 42 meshing with the bevel wheel 36.

The water jet M ejected from the nozzle 3 of the sprinkler tube impinges on the turbine S^4 which rotates shaft 41 and through the intermediary of the bevel wheel gear 42, 36 the casing G. The rotation of the casing is transmitted to the shaft 15 which rotates the spur wheel 18. The consequent rolling of this spur wheel on the crown of teeth 4 results in imparting a circulating movement to the sprinkler tube 2.

The driving gear of the sprinkler is further simplified and rendered adaptable for numerous purposes by the arrangements shown in Figs. 3, 4 and 6, it is, furthermore, possible to exchange the crown of vanes and the turbine. As the turbine is at a great distance from the casing, especially in the form of construction shown in Fig. 6, dirty water may be used for the admission of the turbine, without the water ascending to the casing.

I claim:—

1. In a long-jet sprinkler having a fixed tubular shaft provided at its upper end with a crown of teeth, a spur wheel having teeth meshing with the teeth of the crown of teeth and adapted to roll on the crown of teeth, a sprinkler tube mounted to rotate about the axis of the shaft, a casing, a rotor element comprising vanes on the top of the casing, the rotor element being mounted to be rotated by a water jet ejected against the vanes through a nozzle on the sprinkler tube facing the vanes, power-transmission means coacting between the rotor element and the spur wheel for effecting rotation of the sprinkler tube comprising an epicyclic-gear train mounted in the casing on the sprinkler tube and driven from the rotor element, means connecting the epicyclic-gear train to the spur wheel to drive the spur wheel, and a shaft extending from said casing and rotated by said gear train, the spur wheel being mounted on the free end of said shaft.

2. In a long-jet sprinkler having a fixed tubular shaft provided at its upper end with a crown of teeth, a spur wheel having teeth meshing with the teeth of the crown of teeth and adapted to roll on the crown of teeth, a sprinkler tube mounted to rotate about the axis of the shaft, a casing, a rotor element comprising vanes on the top of the casing, the rotor element being mounted to be rotated by a water jet ejected against the vanes through a nozzle on the sprinkler tube facing the vanes, power-transmission means coacting between the rotor element and the spur wheel for effecting rotation of the sprinkler tube comprising an epicyclic-gear train mounted in the casing on the sprinkler tube and driven from the rotor element, means connecting the epicyclic-gear train to the spur wheel to drive the spur wheel, a shaft extending from said casing and rotated by said gear train, the spur wheel being mounted on the free end of said shaft, and a stationary bush enclosing said shaft and loosely carrying said casing.

3. In a long-jet sprinkler having a fixed tubular shaft provided at its upper end with a crown of teeth, a spur wheel having teeth meshing with the teeth of the crown of teeth and adapted to roll on the crown of teeth, a sprinkler tube mounted to rotate about the axis of the shaft, a casing, a rotor element comprising vanes on the top of the casing, the rotor element being mounted to be rotated by a water jet ejected against the vanes through a nozzle on the sprinkler tube facing the vanes, power-transmission means coacting between the rotor element and the spur wheel for effecting rotation of the sprinkler tube comprising an epicyclic-gear train mounted in the casing on the sprinkler tube and driven from the rotor element, means connecting the epicyclic-gear train to the spur wheel to drive the spur wheel, a shaft extending from said casing and rotated by said gear train, the spur wheel being mounted on the free end of said shaft, a stationary bush enclosing said shaft and loosely carrying said casing, and a crown of teeth on

the end of said shaft located in said casing meshing with one of the wheels of the epicyclic-gear train.

4. In a long-jet sprinkler having a fixed tubular shaft provided at its upper end with a crown of teeth, a spur wheel having teeth meshing with the teeth of the crown of teeth and adapted to roll on the crown of teeth, a sprinkler tube mounted to rotate about the axis of the shaft, a casing, a rotor element comprising vanes on the top of the casing, the rotor element being mounted to be rotated by a water jet ejected against the vanes through a nozzle on the sprinkler tube facing the vanes, power-transmission means coacting between the rotor element and the spur wheel for effecting rotation of the sprinkler tube comprising an epicyclic-gear train mounted in the casing on the sprinkler tube and driven from the rotor element, means connecting the epicyclic-gear train to the spur wheel to drive the spur wheel, a stationary bush carrying said rotatable casing, a shaft downwardly extending from said casing driven by a wheel of said epicyclic-gear train and extending through said bush, a crown of teeth on the top end of said stationary bush meshing with one of the wheels of said epicyclic-gear train, and a spur wheel on the top end of said shaft meshing with another wheel of said epicyclic-gear train.

5. In a long-jet sprinkler having a fixed tubular shaft provided at its upper end with a crown of teeth, a spur wheel having teeth meshing with the teeth of the crown of teeth and adapted to roll on the crown of teeth, a sprinkler tube mounted to rotate about the axis of the shaft, a casing, a rotor element comprising vanes on the top of the casing, the rotor element being mounted to be rotated by a water jet ejected against the vanes through a nozzle on the sprinkler tube facing the vanes, power-transmission means coacting between the rotor element and the spur wheel for effecting rotation of the sprinkler tube comprising an epicyclic-gear train mounted in the casing on the sprinkler tube and driven from the rotor element, means connecting the epicyclic-gear train to the spur wheel to drive the spur wheel, a stationary bush carrying said rotatable casing, a shaft downwardly extending from said casing driven by a wheel of said epicyclic-gear train and extending through said bush, a crown of teeth on the top end of said stationary bush meshing with one of the wheels of said epicyclic-gear train, a spur wheel on the top end of said shaft meshing with another wheel of said epicyclic-gear train, and a vertical bolt fixed in said casing and guiding the rotatable wheels of said epicyclic-gear train.

6. In a long-jet sprinkler having a fixed tubular shaft provided at its upper end with a crown of teeth, a spur wheel having teeth meshing with the teeth of the crown of teeth and adapted to roll on the crown of teeth, a sprinkler tube mounted to rotate about the axis of the shaft, a casing, a rotor element comprising vanes on the top of the casing, the rotor element being mounted to be rotated by a water jet ejected against the vanes through a nozzle on the sprinkler tube facing the vanes, power-transmission means coacting between the rotor element and the spur wheel for effecting rotation of the sprinkler tube comprising an epicyclic-gear train mounted in the casing on the sprinkler tube and driven from the rotor element, and means connecting the epicyclic-gear train to the spur wheel to drive the spur wheel.

7. In a long-jet sprinkler having a fixed tubular shaft provided at its upper end with a crown of teeth, a spur wheel having teeth meshing with the teeth of the crown of teeth and adapted to roll on the crown of teeth, a sprinkler tube mounted to rotate about the axis of the shaft, a casing, a rotor element comprising vanes on the top of the casing, the rotor element being mounted to be rotated by a water jet ejected against the vanes through a nozzle on the sprinkler tube facing the vanes, power-transmission means coacting between the rotor element and the spur wheel for effecting rotation of the sprinkler tube comprising an epicyclic-gear train mounted in the casing on the sprinkler tube and driven from the rotor element, means connecting the epicyclic-gear train to the spur wheel to drive the spur wheel, a bearing extending from said sprinkler tube to the lower side of the same, the spur wheel having a shaft journaled in said bearing, and a stationary sleeve enclosing said shaft adapted to carry the hub of said rotatable casing.

KARL LÜDWIG LANNINGER.