United States Patent [19]

Carstenson

[11] **3,733,030**

[45] **May 15, 1973**

[54] **UNDERGROUND WATER DISCHARGING AND SPRINKLING DEVICE**

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[22] Filed: **Mar. 29, 1971**

[21] Appl. No.: **128,737**

[52] **U.S. Cl.** **239/205,** 239/206, 239/240, 277/24, 277/203

[51] **Int. Cl.** **B05b 3/04**

[58] **Field of Search**.....239/203, 204, 205, 239/206, 210, 240; 277/24, 203

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[57] **ABSTRACT**

An underground water discharging and irrigation sprinkler including an elongated housing having a riser tube slidably mounted therein, a water motor being mounted adjacent the lowermost end of the riser tube and a discharge nozzle being provided adjacent the other end thereof, and water inlet means connected with the housing for selectively raising the riser tube within the housing to elevate the nozzle thereof above the ground and lowering the riser tube within the housing to retract the nozzle belowground.

6 Claims, 12 Drawing Figures

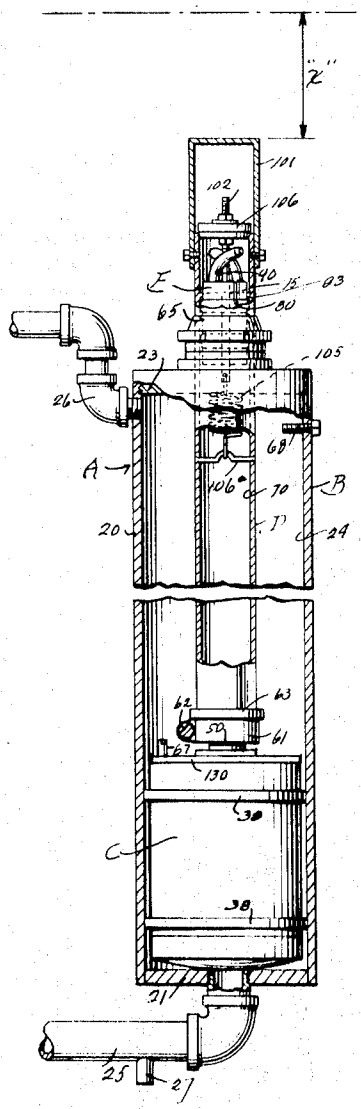


FIG. 2

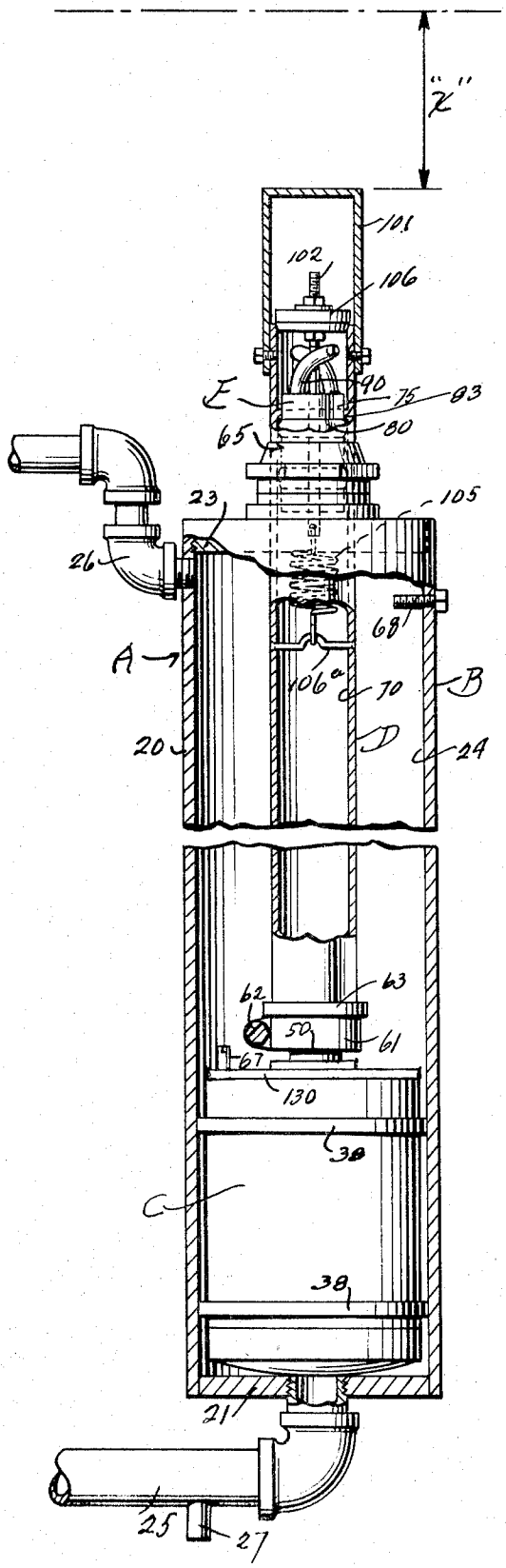


FIG. 1

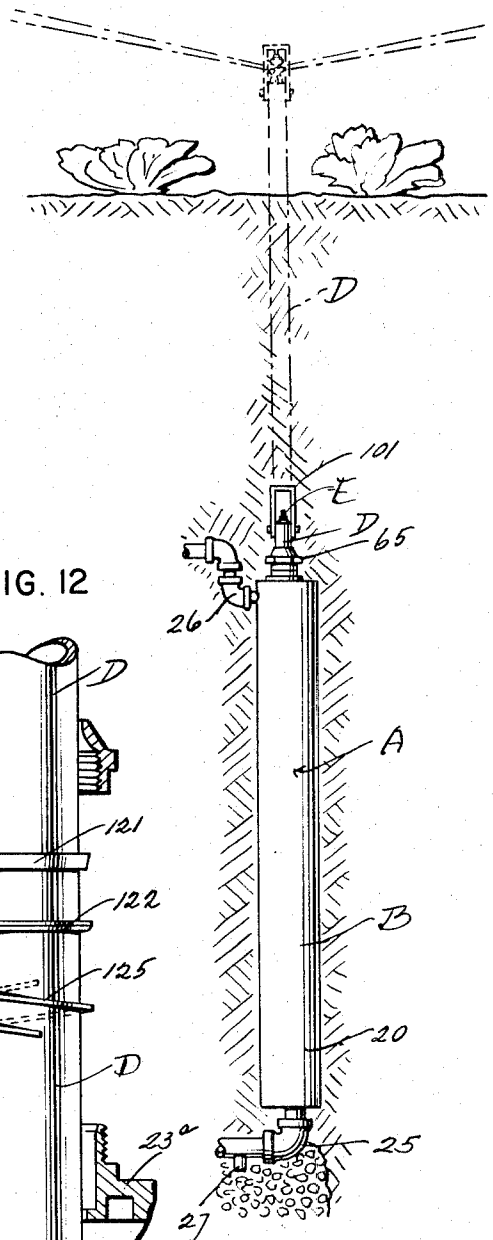


FIG. 12

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FIG. 3

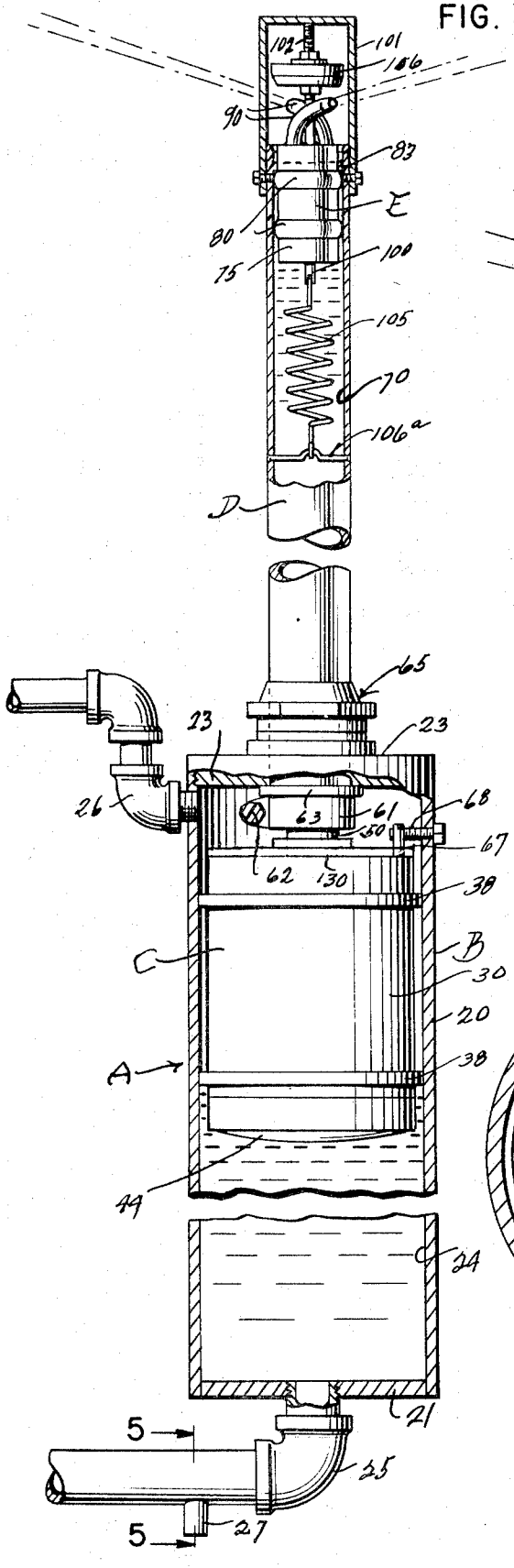


FIG. 4

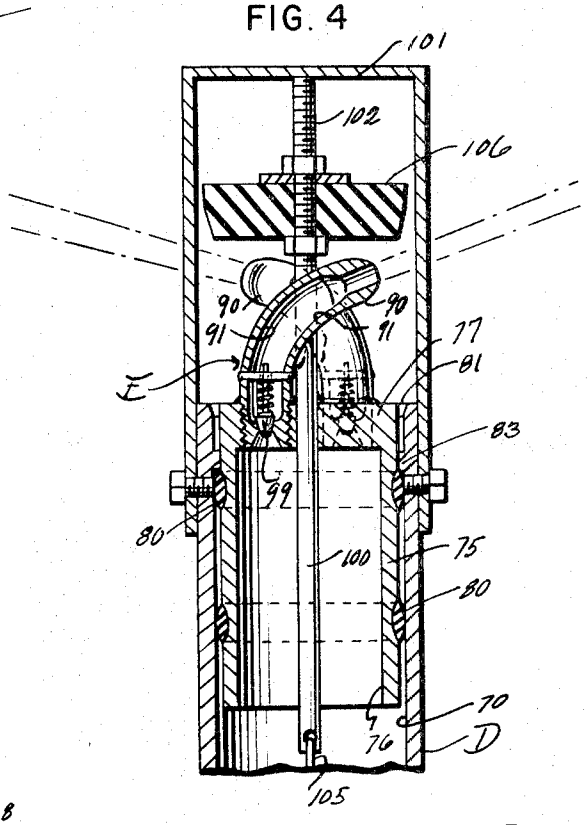


FIG. 5

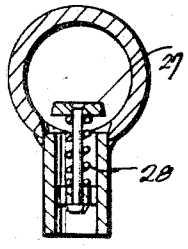
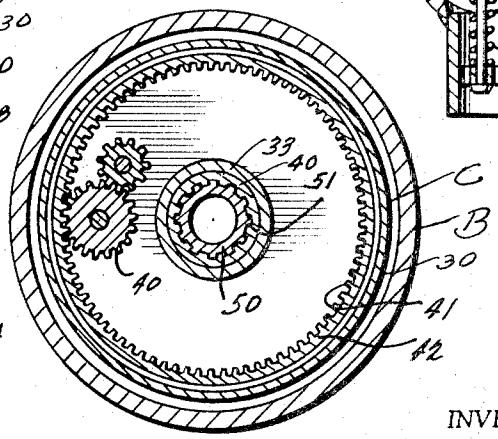


FIG. II



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FIG. 6

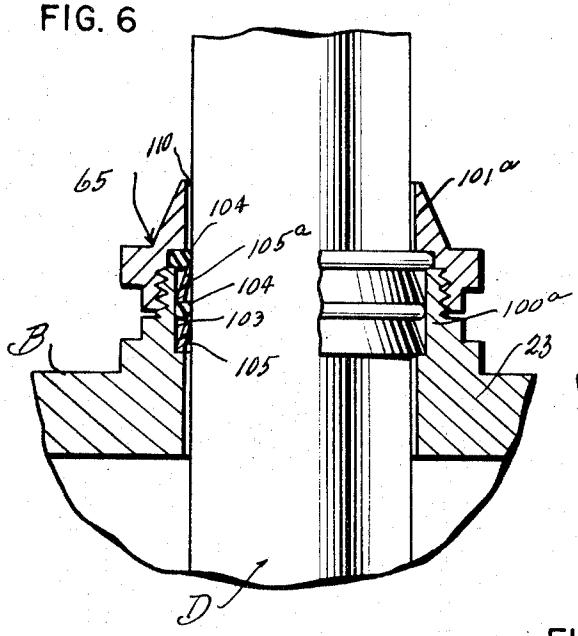


FIG. 7

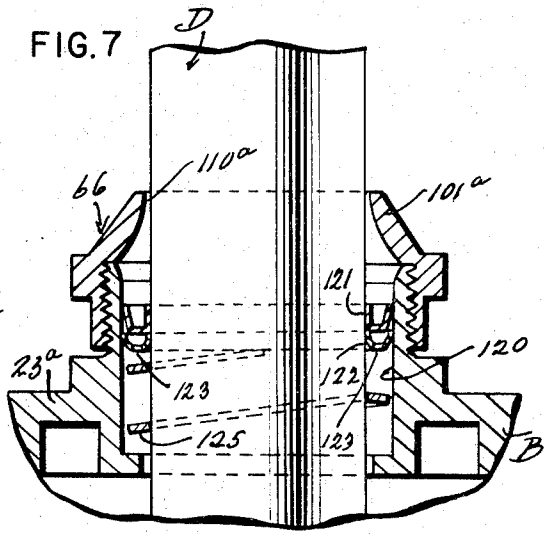


FIG. 9

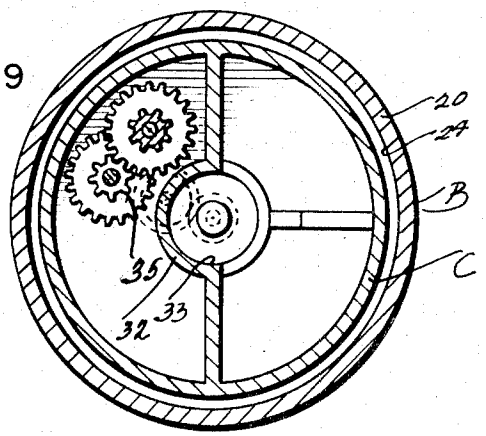


FIG. 8

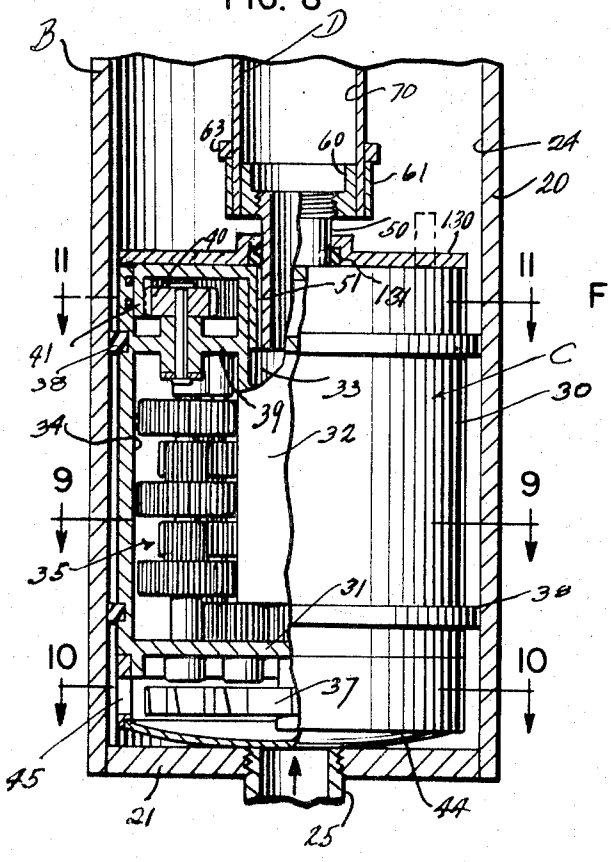
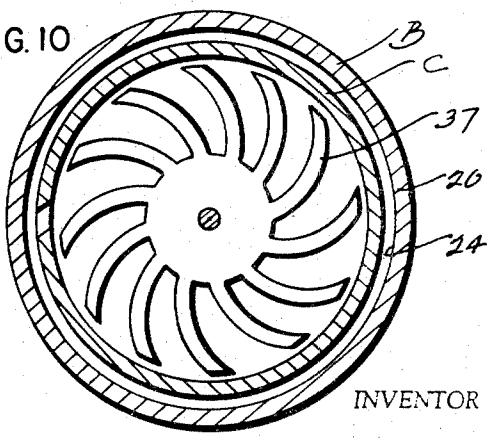


FIG. 10



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UNDERGROUND WATER DISCHARGING AND SPRINKLING DEVICE

This invention relates to an underground water discharging and sprinkling device, primarily for use to irrigate large areas of land.

The primary object of this invention is the provisions of an underground water discharging and sprinkler device which can be used in multiple setups throughout a large ground area to be irrigated or sprinkled. It has control means well known to those skilled in the art to simultaneously control the water sprinkling of a large number of the devices. The improved underground water discharging and sprinkling device is adapted to be placed underground at a good depth so that cultivation may take place in the ground. The device has means for elevating and rotating a riser tube means and its nozzle means to a point above the ground surface for sprinkling and irrigation purposes.

A further object of this invention is the provision of an improved underground water discharging and sprinkling device which includes a housing adapted to be fixed under the ground at a desired depth, which is provided with a water motor which can move along a chamber of the housing for elevating the riser tube means and rotating the latter; water supply means being provided to move the water motor under water pressure upwardly and downwardly within the chamber of the housing. The improved device includes a novel water ejection nozzle system which is self retractable within the riser tube means, and which is piston actuated by the flow of water through the riser tube means to project the nozzle from the top of the ground in position for water discharge and sprinkling.

A further object of this invention is the provision of a riser tube movably supported by an underground water discharging device which can be constructed of metal or synthetic resin material such as "Teflon". Such material enables sediment to be easily cleaned and removed therefrom.

A further object of this invention is the provision of improved riser tube cleaning means to scrape sediment and debris from the riser tube as it is moved downwardly to prevent foreign materials from entering the chamber of the fixed underground housing.

A further object of this invention is the provision of improved means to water lubricate soil around the riser tube as it moves upwardly through the soil above a housing, where a slight discharge of water is permitted to soften the soil and enable a prompt and efficient projection of the tube through the soil.

Other objects and advantages of this invention will be apparent during the course of the following detailed description.

In the accompanying drawings forming a part of this specification, and wherein similar reference characters designate corresponding parts throughout the several views:

FIG. **1** is a view of the improved device fixed in the ground beneath the surface thereof; showing in dot and dash lines the position to which a riser tube may be moved by water impetus to a position which will place a nozzle device above the ground for water discharge.

FIG. **2** is a fragmentary cross sectional view of the device as it stands underground in the position shown in FIG. **1**.

FIG. **3** shows the device with its riser tube means completely elevated with its nozzle means above the ground surface, in position for water sprinkling discharge.

FIG. **4** is an enlarged sectional view through the nozzle means at the upper limit of movement in the riser tube means.

FIG. **5** is an enlarged cross sectional view of a valve located in the water inlet to the housing chamber; the view being taken substantially on the line **5—5** of FIG. **3**.

FIG. **6** is a fragmentary cross sectional view through a packing nut and detritus scraper device through which the riser tube slides in its up and down movements.

FIG. **7** is a modified form of packing nut structure adapted for the same purpose as the packing nut structure of FIG. **6**.

FIG. **8** is a cross sectional view taken through a sprinkler assemblage some of the details of which are shown in U. S. Pat. No. 3,107,056, dated Oct. 15, 1963, such as the drive means for rotating the riser tube of the present invention.

FIGS. **9, 10** and **11** are cross sectional views taken substantially on the respective lines shown in FIG. **8** of the drawings through the water motor shown in FIG. **8**.

FIG. **12** is a view of the details of the packing nut structure shown in FIG. **7** in disconnected relation.

In the drawings wherein for the purpose of illustration are shown preferred and modified details of the invention, the letter A may generally designate the water discharge and sprinkler device. It includes an underground fixed housing B; water motor means C located in the fixed housing for vertical piston-like travel therealong; riser tube means D; and a nozzle means E.

Referring to the housing B, the same may be of various durable materials. It includes a preferably cylindrical shaped side wall structure **20**, a bottom **21** secured thereto, and a detachable top wall **23** upon which a packing nut structure is mounted. The housing B provides a preferably circular elongated chamber **24** adapted to slidably receive in piston-like manner the water motor means C. The bottom wall **21** is provided with water inlet means **25** through which water under pressure enters the chamber **24** below the motor means C for elevating the latter as a piston in a manner to be subsequently described. The housing B furthermore includes a water inlet means **26** opening into the upper part of chamber **24** above the water motor C for the purpose of moving the motor means C downwardly in chamber **24** when the water pressure has been cut off at inlet **25**. The water inlet **25** is preferably provided with a self-operating drain valve **27** for the purpose of draining sediment and water therefrom. It is spring biased at **28** to a normally opened position.

The water motor means C comprises a cylindrical side wall casing **30** having a rigid lower partition plate **31** connected therewith. The interior of the casing **30** is divided by a partition **32** to provide a flow chamber **33** through which the water flows. A second chamber **34** through which the water does not flow houses a reduction gear train **35**. All of this is common to subject matter shown in U. S. Pat. No. 3,107,056. The gear train below the partition plate **31** has connected therewith a turbine wheel **37** shaped as shown in FIG. **10**. The reduction gearing **35** is provided with gear means **40** shown in FIGS. **8** and **9** above a top wall **39** enmashed with an internal gear **41** fixed on a cap **42** rotatably mounted on top of the casing **30** above wall **39**.

The water from the inlet pipe **25** enters the compartment **24** and flows against the bottom wall **44** of the water motor housing **30** and enters through ports **45** into the turbine wheel chamber where the same rotates the turbine wheel and reduction gearing **35.** The water motor casing is externally provided with ring washers **38** for engagement with the walls of casing **20** which are of such nature as to scrape and clean the inner wall surfaces of chamber **24.**

Fixedly attached to the rotary cap **42** of the water motor is a tube **50** which in turn is detachably connected to the lower end of the riser tube means D. Tube **50** is fixedly and rigidly connected by a press or keyed fit at **51** to the rotary cap **42** of the water motor.

Any improved clamping means may be provided for connecting the tube **50** to the riser tube D. As shown in FIG. **8** the upper end of the tube **50,** which is keyed to the rotary cap **42** has a rigid threaded connection with a bushing **60** mounted in the lower end of the riser tube D and fixedly clamped therein by a ring **61** which may have a screw connection **62** for tightening purposes. The riser tube D above the clamping ring **60** is preferably provided with a ring shaped flange **63** to engage the top of the casing **20** to limit the upward movement of the riser tube (See FIG. **3**).

The riser tube D extends upwardly through the central axis portion of casing chamber **24** and slidably extends through a packing assemblage **65,** as shown in FIG. **6** or a modified form of packing assemblage **66** as shown in FIG. **7**; the details of which will be subsequently described.

It will be apparent from the foregoing that a pressurized inlet of water through the pipe **25** forces the water motor C upwardly through the chamber **20** for elevating the riser tube means D through the ground to a position where the nozzle means E extends above the ground surface. As shown in FIGS. **2** and **3** the casing **30** of the water motor has a stop pin **67** extending upwardly therefrom which is adapted to engage the stop pin **68** projecting into the chamber **24** from wall **20,** to prevent rotation of the motor C at its top position, due to torque.

Referring to the nozzle setup E, the same is slidably disposed within the passageway **70** of the riser tube D, the upflow of water forcing the nozzle means upwardly in piston-like manner through the riser tube from its normally rest position which is shown in FIG. **2.** This nozzle setup comprises a casing **75** (FIG. **4**) which may be bottom opened for inlet of water to the chamber **76** therein. The casing **75** is provided with a top wall **77** upon which the jet nozzles are mounted. The outer wall structure of casing **75** is preferably provided with a pair of O shaped flexible washers **80,** adaptably to slide in the passageway **70** of the riser tube. They are of such consistency that a small part of the water forced upwardly will pass by the same and exit at **81** into the ground for moistening and softening the soil during upward rise of the riser tube D. When the nozzle means reaches its top position (see FIG. **4**), the topmost washer **80** engages an internal flange **83** formed on the inner wall of the passageway **70,** to seal any further outlet of water through the passageway **81.**

The nozzle means E on the wall **77** is provided with a plurality of jet tubular nozzles **90** with passageways **91** opening into the nozzle casing wall **77.** These nozzle structures are arcuately turned in the desired manner to rotate the nozzle. They are of such length that they may be collapsed within the tube D to the position shown in FIG. **2.**

Means for retracting the piston type nozzle setup E preferably comprises a rod **100** which at its upper end may contact a U-shaped bail or member **101** (shown in side elevation in FIG. **1**). The bail **101** is connected at **102** to the riser tube D. The rod **100** slidably extends through a central opening in the nozzle wall **77** to a point below the nozzle piston where the same is connected to a biasing spring **105**; the lower end of which is anchored to a cross member **106^a**. The upper end of the rod **100** is threaded at **102** and adapted to adjustably receive a rubber sealing cork **106,** which when the nozzle setup is collapsed within the riser tube engages the top edge of the riser tube D to seal off passage of water or sediment into the riser tube. Normally the spring **105** is biased to pull the cork to the position shown in FIG. **2** in sealing position. It can be expanded to the position shown in FIG. **3** when the nozzle setup is at its top elevation in the riser tube and water is jetting from the nozzles **90.** It should be mentioned that the nozzles **90** may be provided with spring actuated valves **99,** as shown in FIG. **4.** The spring loading is used to produce fogging spray for frosty conditions or to obtain extra range in high winds by using high pressures. The spring loading is not necessary. In use only one nozzle could be spring loaded.

The riser tube D may be constructed of "Teflon" which may be TFE — Flurocarbon resin. The tube D is rigid and the purpose of using "Teflon" is because it is resistant to adhesion of substantially all sticky materials.

The packing shown in FIG. **6** may principally be used to receive a rigid Flurocarbon resin riser tube D. Wall **23** is provided with a screw threaded neck **100^a** adapted to receive a packing nut **101^a**. The neck **100^a** is provided with an enlarged annular gasket chamber **103** adapted to receive packing and scraping materials. The latter may consist of flexible rubber rings **104** and flexible conical shaped or sloping Flurocarbon resin scraping rings **105^a** located and held in the space **103** shown in FIG. **6.** It will be noted that the packing nut **101^a** has a passageway therethrough which is of greater diameter than the outer diameter of the riser tube D, providing a small annular space **110** through which water under the pressure within the chamber **24** may be forced past, by distortion, of the flexible gaskets **104** and **105^a** for the purpose of cleaning the tube D when it descends and also for the purpose of providing some water above the nut **65** for softening the soil as an aid to easy penetration of the riser tube through the soil.

It will be noted that during retraction of the riser tube D through the packing nut **65** the members **105^a** will act as scrapers to scrape off any soil or detritus which is then washed away through the passageway **110,** thus keeping the tube D clean in the housing B.

Referring to the form of packing nut shown in FIG. **7** the top wall **23^a** of the casing B has an annular packing ring receiving chamber **120** adapted to receive an upper rubber expansible ring **121** of U-shaped cross section at any point around it; the groove faces upwardly. Below is located a rigid metallic U-shaped packing member **122** likewise having an annular groove facing upwardly. The bottom of which U-shaped member **122** is provided with a plurality of water passage openings **123.** Beneath the metal ring

122 is located a stainless steel spiral shaped scraper member 125 fitting close around the riser tube E.

The screw cap 101[a] of packer 66 is provided with a passageway 110[a] therein slightly greater in diameter than the external diameter of the tube D for small flow of water therethrough. The packing assembly 66 will take care of large particles of ground and other materials during operation of the device, and the metal ring 122 has a scraping and wiping action on tube D. The member 125 has a spiral scraping action. Water forced up through the spiral scraper 125 takes any loose particles of unwanted material through the holes in the rigid scraper 122 and under pressure the elastic cone rubber washer 121 expands allowing a small quantity of water to flow through the passages 110[a] for soil loosening purposes. When the water pressure from inlet 25 is stopped the rubber cone washer ring 121 returns to its original position tight against the washer 122 closing all holes. This also squeezes tight around the riser tube preventing ground particles from entering the packing gland. The riser tube D for such packing may be of stainless steel, or other suitable metal or materials.

A screw threaded cap (not shown) can be applied to the top of the water motor casing 30 to seal in the grease and water and prevent any tendency of the gear cap to rise or a cap 130 can be rigidly glued to the top of casing 30 as shown in the drawings, with packing 131 sealed against the tube 50 and top of the cap 42.

It will be noted from FIG. 2 that the top of the fully retracted sprinkler is located a distance X below the ground surface. This distance may be rather deep, due to the fact that the riser tube can be elevated a considerable distance. This enables proper plant cultivation.

The operation of the device will be obvious from the foregoing. When the water inlets through the pipe 25 it forces the water motor bodily upward to the position shown in FIG. 3 where rotation thereof is stopped, but rotation of the riser tube is not stopped. Water motor C continues to rotate the riser tube D. Upward pressure of the water, as before mentioned, elevates the jet setup to the position shown in FIGS. 3 and 4.

One of the most difficult problems to solve in continued operation of a riser tube in an underground irrigating or sprinkling pipe is cleaning the riser tube of dirt and deposits during retraction. This is accomplished by the packing glands of FIGS. 6 and 7. Also the ground is lubricated with sufficient water during elevation of the riser tube to enable easy soil penetration of the riser tube and nozzle assembly.

Various changes may be made to the forms of the invention herein shown and described without departing from the spirit of the invention or the scope of the following claims.

I claim:

1. In a water discharging and irrigation sprinkler the combination of a chamber providing housing adapted to be fixed underground far beneath the ground surface, a long riser tube slidably and rotatably carried by the upper part of the housing of a length sufficient to be raised a plurality of feet above a ground surface at its upper end, a water motor fixedly secured to the lower end of the riser tube for travel therewith in slidable upward and downward movement acting as a piston on the walls of the housing chamber, means in the water motor for passage of pressurized water from the housing chamber into the riser tube said water motor having means to rotate the riser tube by water passing therethrough, water inlet means connected with the housing chamber below the water motor to move the water motor bodily upwardly through the chamber of the housing under impetus of the pressurized flow of water upwardly within the housing chamber, nozzle means slidably and rotatably carried by the riser tube at the upper portion thereof located in the top of the riser tube and extensible above the riser tube by upward force of water on the riser tube for jet discharging water from the riser tube, and water inlet means at the upper end of the housing for pressurized flow of water into the housing chamber above the water motor to lower the water motor within the housing chamber upon stoppage of water pressure by the first mentioned water inlet means below the water motor.

2. In a water discharging irrigation sprinkler, the combination of a housing adopted to be fixed underground below the ground surface having a chamber therein, a riser tube slidably and rotatably mounted in the housing of a length adapted to be placed underground and raised far above the housing and above the ground surface at its upper end, a water motor secured to the lower end of the riser tube located within the housing for slidable upward and downward movement in the chamber acting as a piston in the chamber, means in the water motor for passage of water from the housing chamber and the motor into the riser tube, said water motor having means to rotate the riser tube as water passes through the motor, water inlet means connected with the housing chamber below the water motor to move the water motor bodily upwardly through the housing chamber, means in the water motor to move water into and through the riser tube, nozzle means carried by the upper portion of the riser tube for extension and retraction at its upper portion for discharging water from the riser tube at a location above the riser tube far above the ground surface, and a water inlet at the upper end of the housing chamber for passage of water into the chamber above the water motor to retract the water motor and riser tube within the housing chamber upon stoppage of water pressure flow by the first mentioned water inlet means.

3. The device of claim 2 in which the nozzle means consists of a casing having a slidable piston for movement along and within the riser tube under pressure of water moving upwardly in the riser tube to a point where the nozzles will laterally discharge water above the ground at a location far above the riser tube, and means to retract the nozzle means and its casing into the riser tube upon stoppage of water flow upwardly through the riser tube.

4. The device of claim 2 in which the means to retract the nozzle tube consists of spring means which is biased to retract the nozzle means in the riser tube upon stoppage of upward water flow through the riser tube.

5. The device described in claim 2 in which the means to rotate the riser tube of the water motor includes a rotary member having a fixed non-slidable connection with the lower end of the riser tube.

6. In a water discharging and irrigation sprinkler the combination of a chamber providing housing adapted to be fixed underground far beneath the ground surface, a long riser tube slidably and rotatably carried by the upper part of the housing of a length sufficient to be raised a plurality of feet above a ground surface at its upper end, a water motor fixedly secured to the lower end of the riser tube for travel therewith in slid-

able upward and downward movement acting as a piston on the walls of the housing chamber, means in the water motor for passage of pressurized water from the housing chamber into the riser tube said water motor having means to rotate the riser tube by water passing therethrough, water inlet means connected with the housing chamber below the water motor to move the water motor bodily upwardly through the chamber of the housing under impetus of the pressurized flow of water upwardly within the housing chamber, nozzle means carried by the riser tube at the upper portion thereof for discharging water from the riser tube, and water inlet means at the upper end of the housing for pressurized flow of water into the housing chamber above the water motor to lower the water motor within the housing chamber upon stoppage of water pressure by the first mentioned inlet means below the water motor.

* * * * *