April 3, 1934. E. J. SWEETLAND 1,953,518

LAWN SPRINKLING MEANS

Filed June 9, 1931

Fig. 1.

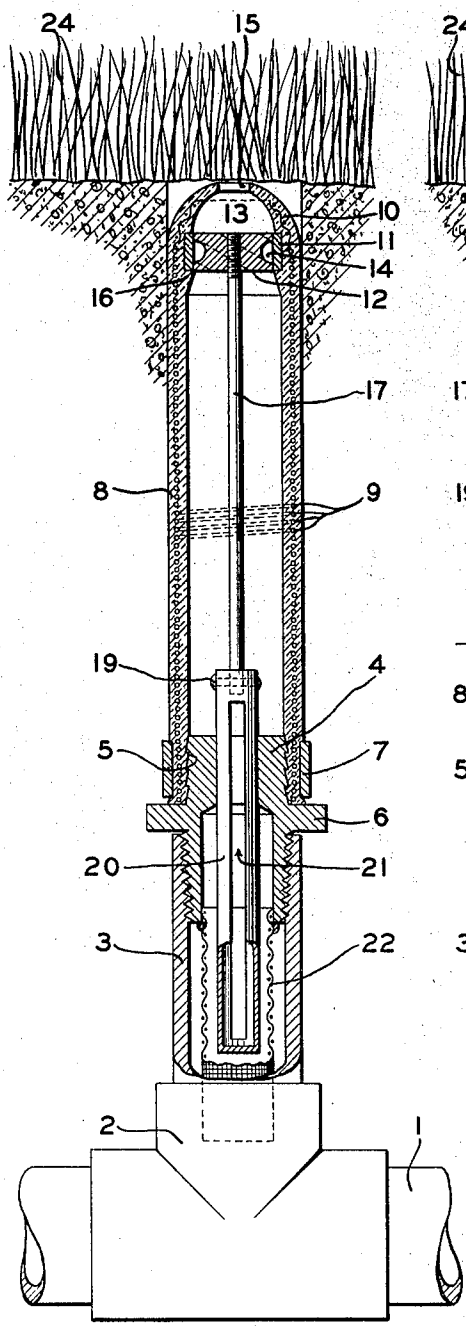



Fig. 2.

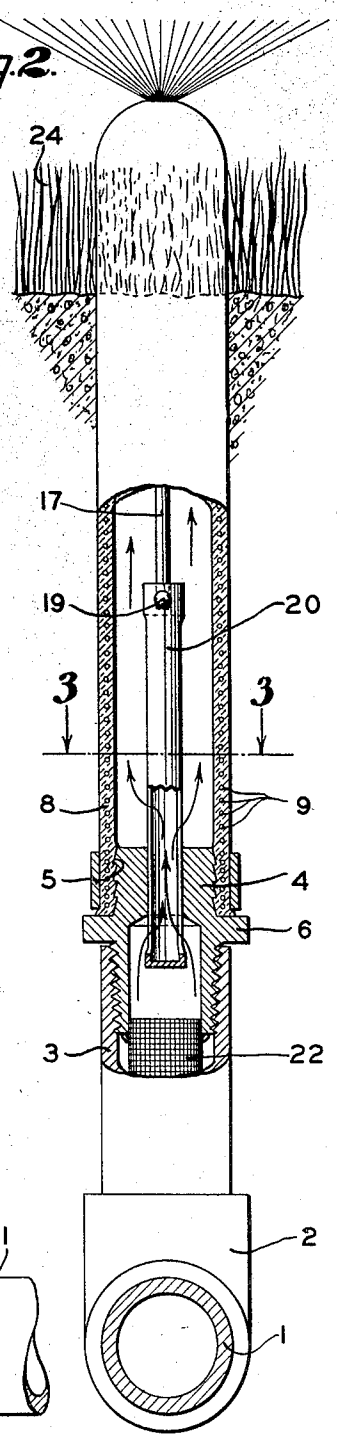



Fig. 3.

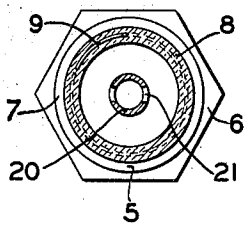



Fig. 4.

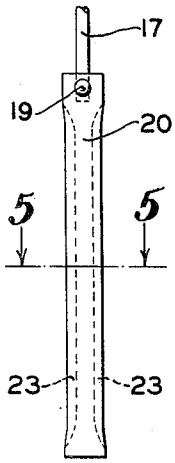
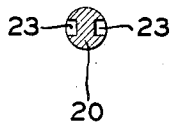



Fig. 5.




INVENTOR

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# UNITED STATES PATENT OFFICE

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## LAWN SPRINKLING MEANS

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Application June 9, 1931, Serial No. 543,685

14 Claims. (Cl. 299—61)

This invention relates to sprinkling means and particularly to lawn sprinkling means which is normally concealed below the surface of the grass when not in service but which automatically rises above the surface when water pressure is applied.

A further object is to provide a disappearing nozzle of non-rigid construction which not only is invisible when not in service but which by reason of its flexibility could not possibly injure a person falling upon the nozzle.

A further object is to provide a sprinkler nozzle which entirely eliminates the necessity of providing metallic guides or parts of any character upon the surface of the lawn.

A further object is to provide a sprinkler head which gives a substantially uniform delivery of water in gallons per minute regardless of the pressure applied on the pipe line to which the nozzle is attached.

A further object is to provide a sprinkling device having a sprinkler head attached to a tube of non-metallic elastic material wherein the elastic material is protected against excessive strain regardless of the water pressure on the pipe line to which the device is attached.

A further object is to provide a sprinkler nozzle wherein the water pressure is automatically regulated to produce the desired spread of the spray regardless of the water pressure applied.

A further object is to provide a sprinkling device which will reduce the amount of atomization of water at the point of delivery by automatically reducing the pressure of water in the conduit between the sprinkler head and the source of water supply.

A further object is to provide means of limiting the stretch of a flexible sprinkler head tube in such manner that the rise of the sprinkler head above the lawn will be uniform regardless of the water pressure applied.

Other advantages of my invention will be apparent from the accompanying drawing and the following description which illustrate and describe a simple method of applying the invention. It should be understood however that I do not limit myself to the specific forms herein shown and described for the invention as set forth in the following claims is capable of many modifications.

Referring to the drawing:

Figure 1 illustrates a sectional elevation of the invention in place but not in operation.

Figure 2 is an elevation partially in section showing the same device that is shown in Figure 1 in extended position while in operation. This view is taken on a line at right angles to the view shown in Figure 1.

Figure 3 is a cross section taken on the lines 3—3 of Figure 2.

Figure 4 is a modified form of a valve unit which may be substituted for the valve unit illustrated in Figures 1 and 2.

Figure 5 is a cross section on the lines 5—5 of Figure 4.

In the following description and reference to the drawing I shall refer to certain portions of the construction as "rubber". It should be understood that where the term "rubber" is employed it does not necessarily mean pure rubber but applies to rubber compositions such as are ordinarily known as rubber, or to rubber substitutes or compositions which possess the elastic properties of rubber.

Referring to the drawing in detail and particularly to Figure 1, the numeral 1 indicates an underground metal pipe provided with the T 2 which is provided with the nipple 3. Into the nipple 3 is screwed a casting 4 which is threaded on its lower end to engage the threads of the nipple 3 and its upper end is provided with corrugations 5 which facilitate a tight connection with the reinforced rubber element 8. The portion 6 of the casting is hexagonal in shape to facilitate grasping it with a wrench. 7 is a ferrule or hose clamp which tightly secures the tube 8 to the casting.

The tube 8 is made of a rubber composition which is quite soft and flexible and in most instances this is to the touch similar in flexibility to the rubber employed in automobile tire inner tubes so that it is quite elastic and free to stretch as distinguished from the more heavily compounded and much less elastic types of rubber commonly employed in garden hose and the like. To carry out the object of my invention it is necessary to control the elasticity of this rubber so that the tube when subjected to pressure will stretch longitudinally while it is reinforced against lateral or circumferential stretching. To accomplish this object I form the tube by first wrapping a layer of the desired rubber composition around a suitable mandrel and then with the aid of a lathe or suitable winding machine a rubberized cotton cord is wound on the rubber at the desired pitch. The pitch of winding is varied according to the diameter and strength of the cord insert and the strength desired. In any event the cord is wound closely enough together to prevent the inner walls of the rubber blowing out when the tube is subjected to the pressure. Ordinarily I find that a cord of 6 to 10 pounds breaking strength wound on from 24 to 36 pitch is satisfactory for the purpose. This rubberized cord having been wound around the inner layer of rubber on the mandrel, the outer covering of rubber is then applied and the tube is wrapped or placed in a mold and vulcanized by methods well known in the art. This cord reinforcement is indicated by the numeral 9 in the drawing and it should be noted that the

layer of rubber inside the cord reinforcement is preferably made thicker than the layer outside for the thicker body on the inside tends to prevent any danger of blow-out even after the tube is considerably elongated with a corresponding increase in the distance between the reinforcing cords. While I prefer the method of reinforcing just described it should be understood that a similar result could be obtained by first preparing a sheet of uncured rubber with a plurality of parallel cords on one of its surfaces, or embedding the parallel cords within the sheet and then winding the corded sheet around the mandrel either one or more turns so that the ends of the cords overlap sufficiently to give the tube the necessary strength. In either instance the finished tube may have a single layer of cords for reinforcement as shown in the figures or two or more layers if desired.

The numeral 10 indicates a special reinforcement which I prefer to make of wire gauze to reinforce the upper extremity of the nozzle and eliminate any danger of the metal ferrule 11 with the accompanying spiral nozzle disc 12 which is a tight compressed fit into the ferrule 11, from blowing out. 13 is a dome-shaped chamber which I sometimes call a swirl chamber into which the water is discharged at high velocity through the spiral nozzles 14 and is finally discharged in the form of a spray through the circular aperture 15 at the top of the sprinkler head.

In the form shown in the accompanying drawing the ferrule 11 with its spiral nozzle 12 may be assembled in the tube either before or after vulcanizing. In the event that they are placed after the tube is vulcanized they are pushed with some force past the rubber shoulder 16 which yields sufficiently to permit the unit to snap into place but prevents it from coming out afterwards. 17 is a connecting rod which is either threaded or riveted at its upper end into the spiral nozzle 12 and at the lower end it is secured by the pin 19 to the valve element 20, the hole in the bottom of the connecting rod being quite large to allow considerable freedom at the joint. The valve 20 is of tubular construction and is provided with slotted openings 21, the function of which will be described in detail later. The bottom of this tube is closed so that water may not pass through the casting 4 except by passing through the slots 21. The hole through the casting 4 through which the valve element 20 slides up and down is large enough to permit the element to slide freely without resistance, yet small enough to prevent excessive leakage past the valve. 22 is a screen which protects the valve against mechanical injury during shipment and installation and protects the valve and nozzle against stoppage by foreign matter that might occur in the water.

The same numerals and description apply to Figure 2 as to Figure 1 but in this drawing the nozzle is represented in operation and the flow of water through the valve is indicated by arrows.

Figure 3 shows the hexagonal nut 6, the ferrule 7 and the rubber tube 8 with its spiral reinforcing cord 9. The valve 20 is here shown in cross section.

As will be noted from the drawing the valve 20 in Figures 1 and 2 was of tubular construction. The modification shown in Figure 4 contemplates the use of a valve made from solid rod into which the slots 23 have been milled.

The grass growing on the surface of the lawn is indicated by the numeral 24.

While for the sake of simplicity I have illustrated the slots 21 of the valve 20 as being straight and of uniform width it should be understood that I may, without departing from the spirit of my invention vary the shape and size of these slots to meet my requirements. For instance, the slots may be made wide at the top and narrower at the bottom in order to produce finer adjustment near the upper end of the stroke or I may place auxiliary slots in the valve to increase the freedom of flow at certain positions of the valve; or the slots may be omitted entirely and holes substituted in their place. Similarly, I may modify the construction of the valve illustrated in Figure 4 by varying the depth or width of the slots in order to give any desired area of opening at any point in the travel of the valve. A great many interesting and useful variations may be obtained by varying the openings in the slot and varying the length of the connecting rod 17. Also it should be noted that the size of the spiral nozzles in the disc 12 and the degree of elasticity of the tube will have an important relation to the design of the valve and that it is within the scope of my invention to form the passageways through the valve in any manner desired to produce the desired result. For instance, if it is desired to provide a liberal upward movement of the sprinkler head with a comparatively low water pressure, the rubber walls would be made comparatively thin but with the size of the opening in the nozzles correlated to the openings in the valve and the length of the valve so as to give the desired elevation without placing excessive strain on the rubber walls where the water pressure might be sufficient to injure the walls of the tube if unrestricted by the valve.

The important function of the valve 20 will be better understood by the following tables:

TABLE No. 1

*With valve in place*

| Pressure lbs. per sq. in. | Elongation | Discharge gals. per min. |
|---|---|---|
| 20 | ½" | 2 |
| 30 | ¾ | 2½ |
| 40 | 1⅛ | 2⅝ |
| 50 | 1¼ | 2½ |
| 60 | 1⅜ | 2⅜ |
| 70 | 1⅜ | 2 |

TABLE No. 2

*Same apparatus with valve removed*

| Pressure lbs. per sq. in. | Elongation | Discharge gals. per min. |
|---|---|---|
| 20 | ½" | 2 |
| 30 | ¾ | 2⅜ |
| 40 | 1¼ | 2⅞ |
| 50 | 1¾ | 3¼ |
| 60 | 2⅜ | 3½ |
| 70 | 3¼ | 3⅞ |

It will be noted from Table No. 1 that when the tube is elongated to the extent of approximately 1¼ inches the length remained practically constant and that the discharge through the nozzle was even less when 70 lbs. pressure was on the pipe line than when it reached its maximum delivery of 2½ gals. per minute at 40 lbs. pressure

indicating that contrary to the excess pressure injuring the tube, it was so protected by the valve that the pressure within the tube, and consequently the discharge, was actually less at 70 lbs. pressure than at 40 lbs. pressure. On the other hand, as indicated by Table No. 2 when the valve was removed the elongation reached 3¼ inches and the discharge 3⅞ gals. per minute at pressure of 70 lbs. per square inch. In this latter case the results indicated that the tube was not only strained to a dangerous point at the higher pressure but that the high velocity of discharge resulted in a large percentage of the discharge being atomized, which is to be avoided in a well designed nozzle because atomization results in excessive evaporation as well as in a large percentage of the atomized water or mist being blown away without doing effective work in irrigating the lawn.

In ordinary operation there are a plurality of the completed sprinkler heads suitably spaced on the lawn and supplied with water from a common header provided with a valve which is turned on automatically or otherwise when irrigation is desired. As soon as the water is turned on the inrushing water expels the air from the system and immediately when the tube 8 fills with water the tube extends longitudinally to the position shown in Figure 2 causing the valve 20 to rise until the greater part of the slots 21 have risen above the walls of the casting 4. At a certain point a balance is automatically struck between the slotted openings below the casting and the discharge of the nozzle and the sprinkler head remains in fixed position above the surface of the lawn so long as the water pressure remains constant. If the pressure tends to reduce for any reason, the elasticity of the tube tends to lower the sprinkler head and thus cause the valve to lower and increase the size of the openings below the casting 4, until a balance is again reached; but if the pressure tends to increase then the valve rises and diminishes the size of the inlet openings so that no matter how high the pressure goes the openings regulate themselves so as to prevent excessive pressure and consequent strain on the tube.

An important use of the invention resides in equalizing the discharge from a plurality of sprinklers irrespective of the location of said sprinklers or of the water pressure at each individual unit. For instance, an installation may be made in a hillside where the uppermost sprinkler may be at an elevation of 40 feet above the lowermost sprinkler. By reason of this difference in elevation there would be a difference in pressure of approximately 17 lbs. per square inch between the uppermost and lowermost sprinkler head. By the use of my invention the valves close to a lesser extent on the uppermost sprinklers where the pressure is lowest than on the sprinklers subjected to a higher water pressure with the result that substantially equal discharge and distribution is effected throughout the area. On the other hand, with the same system of piping and without individual pressure regulation the lowermost portions of the lawn would receive a considerably larger amount of water than the uppermost portions with the result that the upper section would be under-irrigated while the lower section may receive an excess of water, a portion of which may run off and do actual damage to the lawn. Such features are of increased importance where high standards in the quality of the lawns as well as excessive cost of water are taken into consideration.

The value of this device is best realized when it is understood that city water pressure is subject to wide fluctuations. At night (the best time to irrigate) the pressure is usually at its maximum whereas in the early evening hours when many are using the water for irrigation, the pressure falls to a very low point and without the use of the valve it is difficult to design a tube having the desired elasticity to meet these varying requirements, for a tube made heavy enough to stand 70 or 80 lbs. pressure without the valve, would not have sufficient elasticity at 30 or 40 lbs. pressure to rise above the surface of the lawn. Furthermore, from a merchandizing point of view the invention is valuable because water pressure varies in different cities as well as in different locations in the same city so that without this automatic regulating means it would be necessary to manufacture a great variety of sprinklers to meet the varying requirements, whereas with the use of the valve a single standard may be maintained to meet all requirements.

While I have illustrated and described but a single form of reinforcing rubber tube to prevent lateral expansion while permitting longitudinal extension, it should be understood that many modifications are possible, such for instance as substituting a metallic wire reinforcement in place of the cords 9, and in this event a spiral wire reinforcement could be embedded in the outside of the rubber tube instead of being completely covered by the rubber as shown, if desired; or I might substitute a wire reinforcement to take the place of the cord 9 having said wire peripherally wound with cotton after the manner employed in making cotton covered wire such as is ordinarily used in certain classes of electrical work.

While the principles herein employed are specifically described with reference to lawn sprinkling means, I reserve the right to use the principles covered for any purpose for which they may be applicable.

What I claim is:

1. Lawn sprinkling means comprising an underground conduit permanently located beneath the surface of the lawn, a sprinkler nozzle mounted upon a flexible tube adjacent to the surface of said lawn and adapted to rise above the surface when water pressure is applied, a valve between the sprinkler nozzle and said conduit adapted to restrict the flow of water through said nozzle when the nozzle rises to a certain point above the level of the lawn.

2. A valve comprising a spirally reinforced rubber tube, a discharge opening adjacent to one end of the tube, a valve casing adjacent to the opposite end of said tube, and a valve member which is actuated by the elongation of said rubber tube.

3. A valve comprising a non-metallic spirally reinforced elastic tube and fluid discharge opening adjacent to one end of said tube and an inlet opening adjacent to the opposite end of said tube, valved means of regulating the size of the inlet opening which is varied in size by the elongation of said tube.

4. Fluid discharge control means comprising an elastic tube provided with spiral reinforcement capable of preventing substantial increase in the diameter of said tube while permitting said tube to elongate when subjected to pressure, a discharge opening adjacent to one end of said

tube and an inlet adjacent to the opposite end of said tube, a valve located adjacent to the inlet end of said tube and means of connecting said valve to a point adjacent to the outlet opening whereby the elongation of the tube tends to restrict the opening of said valve.

5. Lawn sprinkling means comprising an extensible tube permanently imbedded below the surface of the lawn and connected to an underground pipe, a nozzle at the upper extremity of said tube and a valve adjacent to the lower extremity thereof, connecting means between said valve and a point adjacent to said nozzle whereby the valve opening is regulated by the extension of said tube.

6. Lawn sprinkling means comprising an elastic conduit imbedded within said lawn and permanently connected at its lower extremity to an underground water supply pipe, a nozzle adjacent to the upper extremity of said elastic conduit and a valve adjacent to the lower extremity thereof, connecting means between said valve and a point adjacent to said nozzle whereby the opening in said valve is varied by the lengthening of said elastic conduit.

7. In combination, an extensible resilient water conduit with a valve adjacent to one end of said conduit and a nozzle adjacent to the opposite end, connecting means between said valve and a point near the opposite end of said conduit whereby said valve is automatically operated by variation in the length of said conduit and the consequent movement of the nozzle opening.

8. A pressure controlled discharge valve comprising a valve member slidably mounted in a valve casing, a non-metallic elastic tube mounted upon the outer surface of said valve casing and extending to a discharge aperture, a perforate partition adjacent to said aperture and a connecting rod between said partition and said valve member, said tube being reinforced to prevent lateral expansion while permitting longitudinal extension.

9. A pressure controlled discharge valve comprising a valve member slidably mounted in a valve casing, a non-metallic elastic tube mounted upon the outer surface of said valve casing and extending to a discharge aperture, a perforate partition adjacent to said aperture and a connecting rod between said partition and said valve member, said tube being reinforced to prevent lateral expansion while permitting longitudinal extension, a passageway through said valve being reduced in area by the elongation of said tube and the increase in the distance between the valve casing and the discharge opening.

10. Lawn sprinkling means comprising an underground pipe having a substantially upright valve casing rigidly attached to said pipe, a tube of rubber having internal peripheral reinforcements connected with said valve casing, a discharge nozzle in the upper extremity of said tube and a perforated partition adjacent to said nozzle, connecting means between said partition and a valve member slidably mounted in said valve casing whereby the extension of said rubber tube tends to restrict the flow through said valve.

11. A regulating valve comprising a valve member, an elastic tubular element having helical reinforcements to restrain lateral expansion while permitting longitudinal extension, connecting means between said valve member and said tubular element whereby said valve is actuated by the extension of said tubular element, means for connecting the interior of said tubular element with a fluid container.

12. A regulating valve comprising a valve member, an elastic tubular element having imbedded helical reinforcement to restrain lateral expansion while permitting longitudinal extension, connecting means between said valve member and said tubular element whereby said valve is actuated by the extension of said tubular element, means for connecting the interior of said tubular element with a fluid container.

13. A regulating valve comprising a valve member, an elastic tubular element having helical reinforcements to restrain lateral expansion while permitting longitudinal extension, means for connecting the interior of said element with a fluid container, said valve member being actuated by the extension of said element.

14. A regulating valve comprising a valve member, an elastic tubular element having imbedded circular reinforcement to restrain lateral expansion while permitting longitudinal extension, connecting means between said valve member and said tubular element whereby said valve is actuated by the extension of said tubular element, means for connecting the interior of said tubular element with a fluid container.

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