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Gilead

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[54] **IRRIGATION DEVICE**

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[52] **U.S. Cl.** **239/542;** 138/140

[51] **Int. Cl.** **B05b 15/00**

[58] **Field of Search** 239/542, 145; 137/590; 138/140, 142, 144

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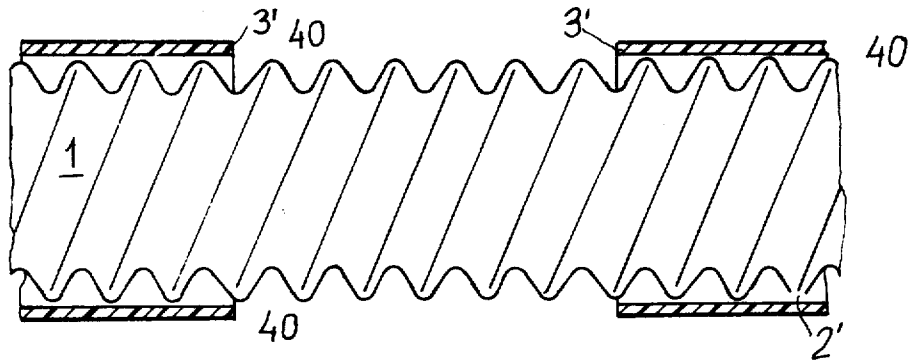
Primary Examiner—Lloyd L. King

Attorney, Agent, or Firm—Weingarten, Maxham and Schurgin

[57] **ABSTRACT**

A trickle or drip irrigation device comprises two hose like elements inserted into one another, one of said elements being constituted by a helically grooved hose of conventional design, the inner member being tightly held in the outer element, openings being provided in the inner element and an outflow or outflows at desired intervals, from the outer element.

8 Claims, 6 Drawing Figures



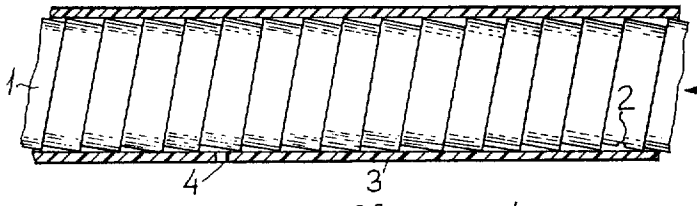


FIG.1

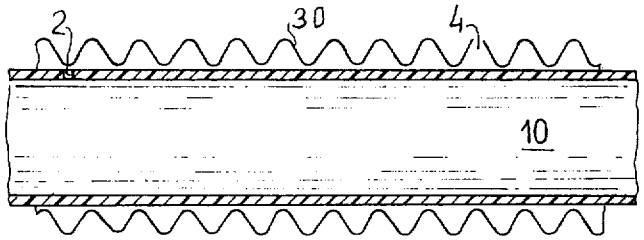


FIG.2

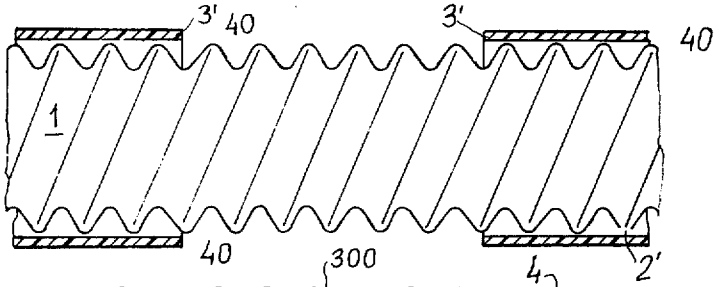


FIG.4

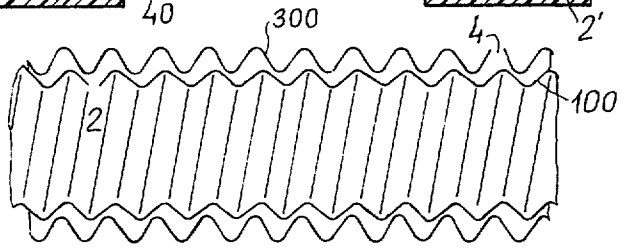


FIG.3

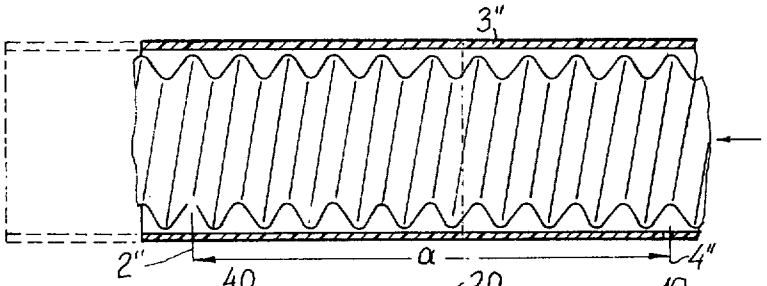


FIG.5

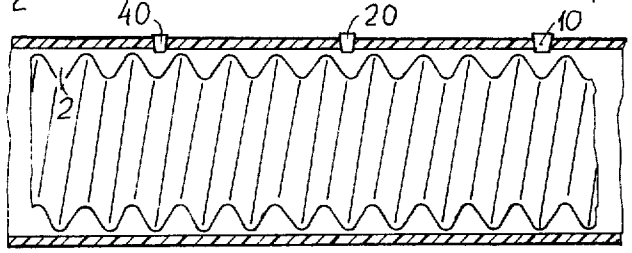


FIG.6

IRRIGATION DEVICE

BACKGROUND OF THE INVENTION

The present invention relates to a trickle or drip irrigation device and furthermore to a method of manufacturing such devices from easily available and inexpensive materials. There are known plastic hoses which are used to enclose electrical conduits or for like purposes and which are helically grooved. These hoses which are commercially available at relatively low expense can be used in the manufacture of trickle or drip irrigating devices.

As is well known, drip or trickle irrigation is used wherever water is rare and where with the conventional devices quantities of water are dispensed from the sprinklers (or whatever other device), which are not only superfluous but in many cases harmful to the plants to be irrigated.

SUMMARY OF THE INVENTION

According to the present invention, there is provided a trickle or drip irrigation device comprising two hose like elements inserted into one another, one of said elements being constituted by a helically grooved hose of conventional design, the inner member being tightly held in the outer element, openings being provided in the inner element and an outflow or outflows at desired intervals, from the outer element.

According to one form of the invention, the inner element is spirally grooved and its largest diameter is equal to or larger than the inner diameter of the smooth (ungrooved) outer element.

In another practical embodiment, the inner member is an ungrooved hose which is inserted into the outer, helically grooved element, the outer diameter of the inner element being equal to or larger than the smallest diameter of the grooved, outer element.

Finally in yet another practical form both the inner and the outer elements are helically grooved and the largest outer diameter of the inner element is equal to the smallest inner diameter of the outer element, the helix of the inner and that of the outer elements being superposed when viewed in an axial section.

In all these cases a helical path is formed between the outer and the inner elements.

An assembly of the inner and outer element provided with the openings indicatd above, can be manufactured in endless lengths and can be used as a water conduit the water trickling from the outflow openings in the outer member.

With such a commodity, it is possible for the ultimate consumer, i.e., the gardener or agriculturist, to cut pieces at will and connect these cut pieces to water conduits of whatever kind, the cut piece then serving as a trickle emitting member.

In another variation of the invention, it is possible to provide ths short sections of the outer element on the inner element at predetermined intervals, thus having the water flow in the innermost element which constitutes a supply conduit, while the outflow occurs at those points where the inner member is enclosed in the said short length of outer element.

BRIEF DESCRIPTION OF DRAWINGS

The invention will now be described in detail with reference to the annexed drawings which give examples of the new trickle or drip irrigation device. The drawings which are schematical are to be considered as examples and are not meant to restrict the invention to the particular form shown.

In the drawings, FIGS. **1**, **2** and **3** are schematical views of a portion of hose assembly according to the invention, while

FIG. **4** is a schematical longitudinal section through an assembly where the outer member is put on the inner member at intervals from one another.

FIG. **5** illustrates a specific device according to the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning to FIG. **1**, a commercially available helically grooved hose **1** has holes at predetermined points of its lengthwise extension. One of these holes is indicated by the numeral **2**. The hose **1** is firmly inserted into an outer smooth, cylindrical plastic tube **3** which at certain intervals has outlet ports **4**. The greater outer diameter of hose **1** fits tightly into the bore of the outer hose or tube **3**. The inner helically grooved tube may have one helical thread or it may have two thread lines or even more.

Water is presumed to flow in the innermost hose **1** in the direction of the arrow in FIG. **1**. Water will flow out from the hole **2** and continue to flow in a helical path around the inner hose **1** and within the outer hose **3** until it reaches an outlet **4** from which it will trickle or drip slowly. Thus, in the manner known, the helical path which is formed between the inner and outer hoses, lengthens the travel of the water to its outlet **4** and due to the narrow path created by the helical screw thread on the innermost member and the resulting friction in the so created narrow helical conduit; pressure which might exist at the head id lost and the water trickles or drips from the outlet **4**. It will be seen that in this arrangement, the well known principle of trickle emitting devices has been used but the means for building the new emitting device are simple and less costly than conventional means, especially so since the assembly of hoses — at the same time — also serves as water conduit itself.

The variant shown in FIG. **2** is similar to the one just described, but here the inner hose **10** is grooveless and smooth while the outer tube **30** is helically grooved. Again a helical path is formed between the two hoses of which the inner one **10** has an outer diameter equal or larger to the smaller diameter of the outer, grooved hose **30**. Again an opening **2** leads from the interior of hose **10** into the helical path and an outlet port **4** from the latter into the opening.

FIG. **3** illustrates yet another possiblity of two hose element inserted into one another. Here both elements are spirally grooved and the peaks of the helical ridge formed at the outside of the inner element **100** closely and fittingly contact the outer element **300** at the line of the smallest diameter thereof. Also here a hole **2** is shown leading into the helical conduit formed between the two elements **100** and **300** and an outlet port **4**.

Thus in all three cases the desired narrow helically winding conduit is formed, by means of which pressure under which the water might be fed into the line is lost.

It can easily be seen that the assembly so produced will serve as a water conduit and at the same time as the trickle emitting device. The water flows within the inner hose and enters the helical path wherever open-

ings have been provided in the inner hose to continue along the helical path and exit through an outlet in the inner hose.

It can further be seen that whatever desired lengths of the assembly can be cut so that it would be possible to insert such pieces in an existing water conduit or connect it thereto.

Turning now to FIG. **4**, here the outer member indicated by **3'** is not provided along the whole length of the helically grooved inner hose but short lengths of the outer hose are provided at certain intervals. In this arrangement, water flows in the feeding line or conduit constituted by the innermost hose and exits at the ends of portions **3'** after having travelled through the helical path between the inner hose **1** and the outer sections **3'**. The water actually drips out at the points indicated by the numeral **40.** It should be observed that after passing from the interior of the inner hose into the helical path between the two elements, the water may flow in one direction, or also in two directions, i.e., towards both ends of the portions **3'**.

Incidentally, an arrangement as shown in FIG. **4** and which is seen on a larger scale in FIG. **5** can be used also to control the quantity of water emitted during a given time unit from the new device. The example of FIG. **5** makes this clear. It is assumed that water flows in the direction of the arrow in FIG. **5** and the outer piece of grooveless tube is in the position shown in full line, water entering the helical path through the hole **2''** will flow the whose distance indicated by the letter a and will flow ot through the hole **4''**, thus it will have a long way to travel and its velocity and pressure will be reduced very much. If it is assumed that in this arrangement the water emitted during the time unit of **10** min. is one liter, this quantity can be increased by shifting the outer tube **3'** into the position shown in broken lines. Now the way from the hole **2''** to the outflow **4''** will be shortened and therefore there is less loss of pressure and as a result the quantity emitted in the same time unit of **10** mins. will be larger. It can easily be seen that by judiciously shifting the outer member, the quantity of the emitted irrigation water can be controlled. It will be understood that it can be arranged to have markings on the outside of the outer member indicating the position and thus the quantity of water emitted during a time unit.

Another practical embodiment of a trickle emitting device is shown schematically in FIG. **6.** Here the outer hose length **1** is provided with holes stoppered by plugs **40, 20, 10.** Water enters the helical path between the two elements through the hole **2.** Now, anyone of the stoppers being removed, the quantity of water during a time unit can be predetermined. So, e.g., after removal of stopper **40** the water travels a short length of helical path and the quantity emitted might be 40 liters per hour. If only the stopper **20** is removed, the quantity might be 20 l/h and with removal of stopper **10** only the quantity might be 10 l/h.

Certain variations of construction may be resorted to without departing from the spirit of the intentions. So for instance anyone of the described combinations of grooved and an ungrooved element may be enclosed in an outer sheath, itself being a grooved or an ungrooved hose.

While in practice all hoses might be of circular cross section, it would be within the scope of the invention to employ hoses of oval or any other cross section.

The two hose like elements may be produced by an extrusion process, telescoping into one another as they are produced, to be fused together by application of heat, as is known in the art.

What is claimed is:

1. An irrigation device comprising:

an elongated continuous hollow hose for conveying fluid through the interior thereof and formed with a helical fluid flow passage of predetermined pitch between the inner and outer surfaces thereof, said helical passage having an axis substantially coaxial with the longitudinal axis of said hose;

a plurality of holes extending through said inner surface of said hose at predetermined spaced axial distances along said hose, each of said holes coupling the interior of said hose to said helical passage for fluid transmission therebetween;

a plurality of fluid discharge ports extending through said outer surface of said hose each being disposed a predetermined axial distance along said hose from a respective one of said holes in said inner surface and each coupling said helical passage to the region exterior of said hose;

whereby fluid flowing axially through the interior of said hose flows outwardly from said interior of said hose through each of said plurality of holes into said helical passage and thence through said helical passage for discharge through each of said plurality of ports, the fluid discharged from each of said ports being selectively determined by the axial length of said helical passage between respective adjacent ones of said holes and ports.

2. An irrigation device according to claim **1** wherein said elongated continuous hollow hose is formed of inner and outer coaxial tubes having confronting surfaces in tight contact, at least one of said tubes being formed with a helical groove in the respective confronting surface, thereby defining with said other confronting surface said helical fluid flow passage; the inner surface of said inner coaxial tube defining said inner surface of said hose, and said outer surface of said outer coaxial tube defining said outer surface of said hose.

3. An irrigation device according to claim **2** wherein said outer tube has an ungrooved inner surface and wherein said inner tube is formed with said helical groove, thereby defining a helical ridge of a diameter substantially equal to the inner diameter of said outer tube.

4. An irrigation device according to claim **2** wherein said inner tube has an ungrooved outer surface and wherein said outer tube is formed with said helical groove, thereby defining a helical ridge of an inner diameter substantially equal to the outside diameter of said inner tube.

5. An irrigation device according to claim **2** wherein said inner and outer tubes are each formed with a helical groove and each defining a helical ridge and a helical valley;

said tubes being disposed such that the helical ridge of said outer tube is in tight contact with the helical ridge of said inner tube to define said helical fluid flow passage.

6. An irrigation device according to claim **1** and further including a plurality of removable stoppers selectively disposed within respective ones of said ports in said outer surface to prevent fluid discharge therefrom.

7. An irrigation device according to claim 2 wherein said outer tube is formed of a plurality of unconnected axially spaced sections, to define one or more sections at which the outer surface of said inner tube is exposed to the region exterior to said hose for discharge of fluid therefrom.

8. An irrigation device according to claim 7 wherein said unconnected axially spaced sections are each slidable axially along the outer surface of said inner tube to control the flow rate of the fluid discharge.

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