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Mark TONKIN

Salt Water Irrigation

http://www.wired.co.uk/news/archive/2009-05/01/irrigation-system-can-grow-crops-with-salt-water.aspx

Irrigation system can grow crops with salt water
By Katie Scott

A British company has created an irrigation system that can grow crops using salt water.

The dRHS irrigation system consists of a network of sub-surface pipes, which can be filled with almost any water, whether pure, brackish, salted or polluted. The system can even take most industrial waste-water and use it without the need for a purification process.

The pipes are made from a plastic that retains virtually all contaminants while letting clean water through to the plants' roots.

It was designed by Mark Tonkin of http://www.dti-r.co.uk Dsign Technology and Irrigation, which is based in Brighton. He says that once the pipes have been laid, the system will require little maintenance and therefore no significant costs. This is partly because it's fed by gravity from an elevated supply tank, and partly because water diffuses through the porous pipe walls, so there are no holes to get blocked up.

The farmer will occasionally have to lush the pipes to clean out salt crystals and dirt, but Tonkin says this is a simple process.

Since the water is delivered directly to the plant roots, there is much less wastage through evaporation and run-off than with traditional irrigation systems. According to the inventor, it is also impossible to over-water plants, as the system will only release more water as plants draw up clean water from the soil.

The dRHS system, which has been in development for ten years, was initially trialled in the UK using tomato plants, and has since been tried out in the US. The next trials will take place in Chile, Libya, Tanzania, Mauritius and Spain. Tonkin says 20,000 metres of pipe are on their way to the Middle East, where it will be tested with water that's more saline than sea water. The system has so far supported the growth of tomatoes, radishes, courgettes, peppers, lettuce, strawberries and beans as well as three different types of tree - cherry, olive and prosopis. The company is now trying to grow acacias, oaks and banana trees among others.

It has also won international recognition for its work, most recently at the international Water Technology Idol event in Switzerland, organised by [http://www.globalwaterintel.com] Global Water Intelligence magazine and the [http://www.idadesal.org] International Desalination Association.

Christopher Gasson from Global Water Intelligence magazine says that the competition was a three-way tie last year but this year, the winner stood out. "The dRHS irrigation system addressed a bigger problem than the other technology that it was competing against," he said. "Agriculture water is where 70 per cent of water goes. By 2025 two thirds of the world's population will experience water shortages and so farming will be badly hit. "Salination is a huge problem. Already 97.5 per cent of the water in the world is salty, and this is becoming more of a problem as people in poor countries recycle water, sometimes leaving the soil with a salty crust. This system will help a lot."

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http://www.dti-r.co.uk
http://web.mac.com/marktonkin/Site/dRHS.html

The dRHS™ Technology

The dRHS™ Irrigation technology works by a network of sub surface pipes being filled with water, almost any water. The water can be pure, brackish, salted or polluted. The system can even take most waste industrial water and use it directly without purification.

Water diffuses through the pipe walls, there are no holes or emitters to become clogged or blocked, virtually all contaminants are retained within the pipes.

There is no requirement for pressure, the system is gravity fed from a supply tank.

Plants take water on demand but cannot become over watered.

Plants take more water from the dRHS™ pipes as the soil dries out, less if the surrounding soil becomes wetter.

The system is extremely water efficient, there is virtually no loss of water to evaporation or run-off.

There is no limit to the extent of the system -- it can irrigate vast areas of land.

There is no requirement for monitoring or planned irrigation events -- the plants take what water they want when they want it -- each plant in a row may require a different amount of water at a different time, the dRHS™ technology delivers this individuality.

The dRHS™ technology is new and different, it requires a new approach and new techniques.

Patents

IRRIGATION DEVICE
GB2436222
2009-01-30
Inventor(s): TONKIN MARK
Also published as: // WO2007105007 // EP2003951 // CN101404872 // CA2647053 // KR20090010959 (A)
Abstract -- An irrigation system for irrigating a growing medium. The irrigation system comprises a corrugated tubular hydrophilic membrane or a helical tubular hydrophilic membrane which can be buried in a growing medium. The invention also relates to methods of irrigating said growing medium. The hydrophilic membrane can be a hydrophilic polymer based on a polyether.

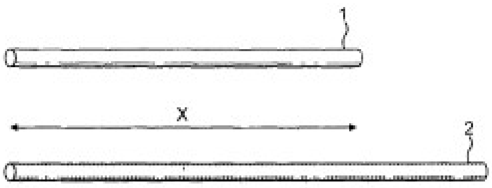

FIG. 1

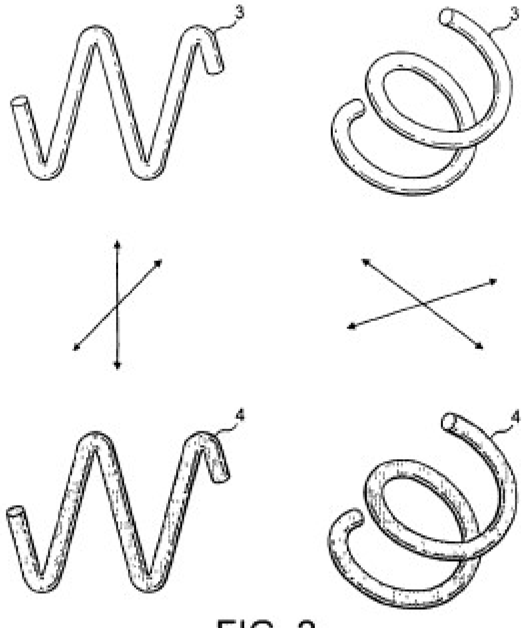

FIG. 2

Excerpts:

The Applicant has noticed that when hydrophilic membranes come into contact with water they absorb water and may expand. A tube made of a copolyetherester elastomer, for example, can expand by at least as much as 10 % along its length when hydrated. This can cause problems if the membrane is buried in a growing medium as in the case of the above methods, when the increase in membrane size cannot be accommodated in the enclosed space in the growth medium. For a tube that is 30 m long, for example, an extra 3 m in length may have to be accommodated when the tube becomes hydrated. If the expansion cannot be accommodated, the membrane may become compressed or distorted and therefore rupture and break, allowing contaminated water to leak into the growing medium. The tube may also fold onto itself within the confined space of the growing medium which would prevent the passage or flow of water and so reduce its effectiveness.

When a helical tubular membrane of the kind described above is buried in a growing medium and provided with water, the expansion of the hydrophilic membrane and therefore the expansion of the tube along its length can be accommodated more easily by the helical shape since the pressure exerted by the expansion of the tube on the surrounding medium is then distributed along its length rather than being confined to the two ends. In other words the absolute linear expansion along the axis of the membrane is reduced. As demonstrated in Figure 1, when a "straight" dehydrated tube (1) is provided with water it may expand along its length. The hydrated tube (2) may be 10% longer than the dehydrated tube (1), for example. However, as shown in Figure 2, when the dehydrated tube is wound into a helix (3), the increase in the length of the tube upon hydration is accommodated by expansion in three dimensions. In particular, the increase in tube length causes the diameter of the hydrated helix (4) to increase as well as the helix length. This means that the expansion in any one direction is minimised and the expansion is therefore more easily accommodated. This means that the membrane is less likely to rupture or fold. The disadvantages discussed above are therefore reduced.

When a corrugated tubular membrane of the kind described above is buried in a growing medium and provided with water, the expansion of the hydrophilic membrane and therefore the expansion of the tube along its length can be accommodated by the corrugated nature of the tubing. In particular, the distance between the ridges and grooves of the corrugated tubing can shorten in order to accommodate the additional membrane material. In other words, the ridges and

By pervaporation is meant the process wherein a given solvent permeates into a non-porous membrane or coating, is transported across the membrane and is subsequently released from the opposite face of the membrane or coating in the form of vapour. Pervaporation is therefore different from known filtration, distillation or reverse osmosis processes in that the product is a vapour and not a liquid. If the solvent is water, non-porous hydrophilic membranes are suitable for pervaporation, because water is readily absorbed by, transported across and released from such a membrane.

As long as the water vapour permeation rate of the membrane in total is sufficiently high, this water can be provided at a rate consistent with its use in a given practical application as described. The non-porous nature of the membranes disclosed here serves to exclude any particulate impurities from passing through such a membrane, including microbes such as bacteria or viruses. In addition, it has been discovered that membranes made from the hydrophilic polymers described in the present invention significantly reduce or prevent the passage of dissolved salts. Therefore, the ability to use not only freshwater, but also water that may contain suspended or dissolved impurities, to produce desired amounts of purified water by pervaporation allows saline water, including but not limited to seawater or brackish water, after processing through the apparatus embodying the present invention, to be used to irrigate land and sustain plant growth, and/or for the controlled release of water vapour into an environment.

A preferred hydrophilic membrane comprises a hydrophilic polymer having a water vapour transmission rate (WVTR) according to ASTM E96-95 (Procedure BW) of at least 400 $g/m^2/24h$, measured using air at 23°C and 50% relative humidity at a velocity of 3 m/s on a film of total thickness 25 microns. A more preferred hydrophilic membrane layer comprises a hydrophilic polymer having a water vapour transmission rate according to ASTM E96-95 (Procedure BW) of at least 3500 $g/m^2/24h$, measured using air at 23°C and 50% relative humidity at a velocity of 3 m/s on a film of total thickness 25 microns.

The hydrophilic polymer can be one or a blend of several polymers, for example, the hydrophilic polymer can be a copolyetherester elastomer or a mixture of two or more copolyetherester elastomers as described below, such as polymers available from E.I. du Pont de Nemours and Company under the trade name Hytrel®; or a polyether-block-polyamide or a mixture of two or more polyether-block-polyamides, such as polymers available from the Elf-Atochem Company of Paris, France under the trade name of PEBAX; or a polyether urethane or a mixture of polyether urethanes; or homopolymers or copolymers of polyvinyl alcohol or a mixture of homopolymers or copolymers of polyvinyl alcohol.

AU2009201496

Water purification apparatus

Inventor: YOUNG MARK ANDREW ; TONKIN MARK CHRISTOPHER
2009-05-14

PT1400166
METHOD OF COLLECTING MATERIALS EXUDED FROM PLANT ROOTS

Inventor: TONKIN MARK CHRISTOPHER [GB] ; YOUNG MARK ANDREW
2007-04-30

WO2009044157
WATER PURIFICATION
Inventor: TONKIN MARK CHRISTOPHER
2009-04-09

KR20090010959

IRRIGATION DEVICE
Inventor: TONKIN MARK
2009-01-30

CL11192008
CONNECTOR
Inventor: TONKIN MARK CHRISTOPHER WATSON
2008-08-29

GB2450029

Irrigation system
Inventor: TONKIN MARK
2008-12-10

AU2003204117
Water purification apparatus
Inventor: TONKIN MARK CHRISTOPHER ; YOUNG MARK ANDREW
2006-01-12

DE60032368
WATER STILL AND METHOD OF OPERATION THEREOF
Inventor: TONKIN MARK CHRISTOPHER [GB] ; YOUNG MARK ANDREW
2008-04-10

DE60025730
IRRIGATION DEVICE
Inventor: TONKIN MARK CHRISTOPHER [GB] ; YOUNG MARK ANDREW
2006-09-14

AU2005247024

Water purification apparatus
Inventor: YOUNG MARK ANDREW ; KIRCHNER OLAF NORBERT
2006-01-19

AU2005201909
Water still and method of operation thereof
Inventor: ECKERT NEIL DAVID ; YOUNG MARK ANDREW
2005-06-02

US2004099601
Water purification apparatus
Inventor: TONKIN MARK CHRISTOPHER [GB] ; YOUNG MARK ANDREW
2004-05-27

US2002130078

Water purification apparatus
Inventor: TONKIN MARK CHRISTOPHER [US] ; YOUNG MARK ANDREW
2002-09-19

EP1588986
Water still with prevaporation membrane and method of operation thereof
Inventor: TONKIN MARK CHRISTOPHER [GB] ; YOUNG MARK ANDREW
2005-10-26

EP1530896
Rooting container and use thereof
Inventor: TONKIN MARK CHRISTOPHER [GB] ; YOUNG MARK ANDREW
2005-05-18

EP1400166
Method of collecting materials exuded from plant roots
Inventor: TONKIN MARK CHRISTOPHER [GB] ; YOUNG MARK ANDREW
2004-03-24
