

# Patents!

Subramanian Iyer

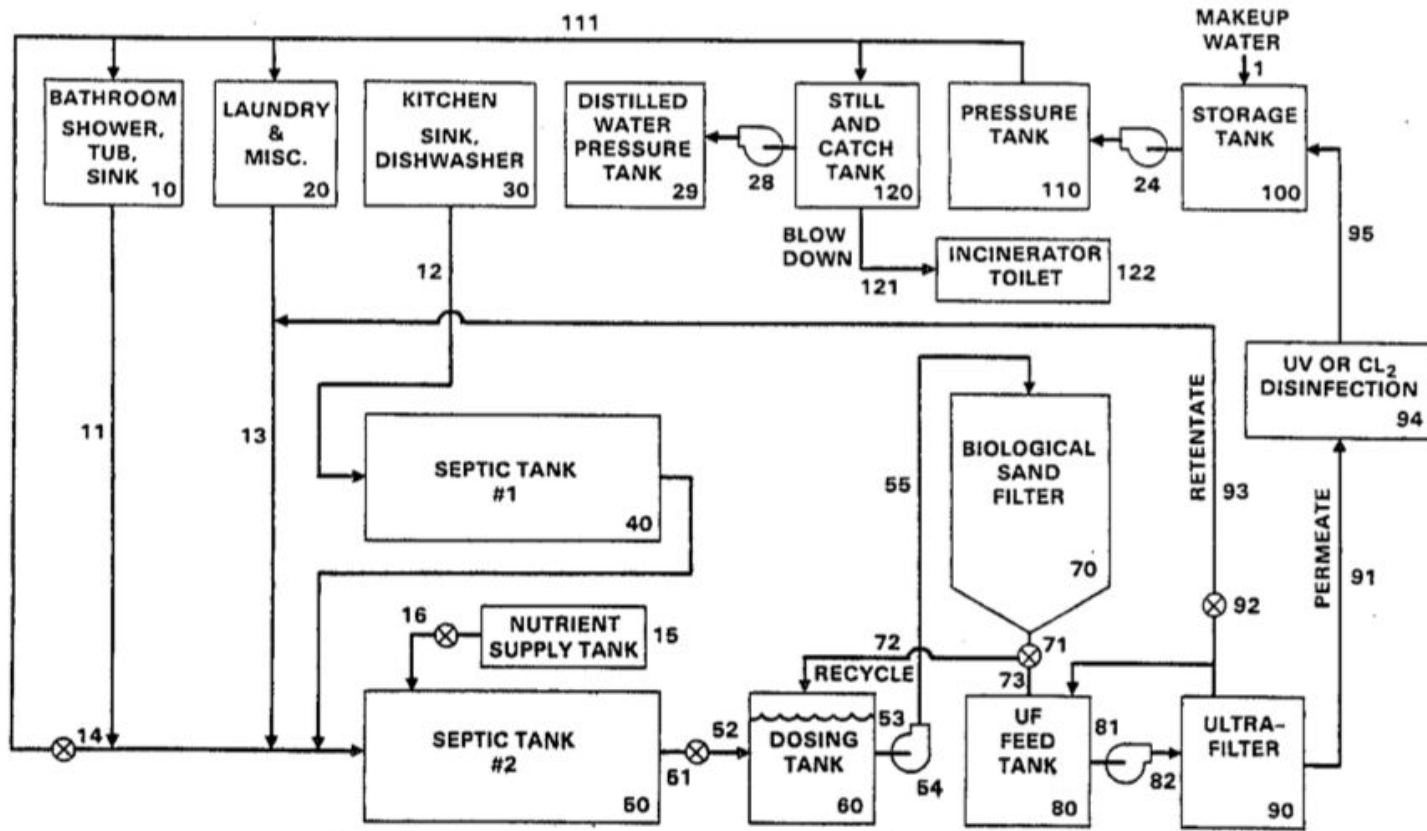
[54] **WATER RECYCLE SYSTEM**[75] **Inventors:** William E. Cawley, Richland, Wash.;  
Basil W. Mercer, Harrison, Id.[73] **Assignee:** Bio Tech, Inc., Richland, Wash.[21] **Appl. No.:** 135,696[22] **Filed:** Dec. 21, 1987[51] **Int. Cl.<sup>4</sup>** ..... C02F 3/30[52] **U.S. Cl.** ..... 210/605; 210/610;  
210/612; 210/617; 210/631; 210/650; 210/652[58] **Field of Search** ..... 210/605, 607, 610, 612,  
210/617, 630, 631, 618, 652, 650, 150, 151,  
768-771, 748, 754, 620-624[56] **References Cited****U.S. PATENT DOCUMENTS**

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*Primary Examiner*—Benoit Castel[57] **ABSTRACT**

A closed water purification and recycle system pro-

cesses domestic wastewater to produce potable water for cooking, drinking and dishwashing and water suitable for general household use, such as washing clothes and personal hygiene. The system consists of septic tanks, a biological sand filter, an ultrafilter, a disinfection unit, pumps, valves, water quality and quantity sensors to monitor and control the process. The system also includes an incinerator toilet to eliminate the need for toilet flush water. Water for cooking, drinking and dishwashing is produced by a still using some of the recycled water for feed. The quality of the recycled water is monitored to assure the product water is suitable for the intended uses. Water thus produced is stored until reused. The system will be automatically shut down if the final product water quality does not meet specifications. Blowdown containing concentrated salts from the still is evaporated and incinerated in the incinerator toilet to maintain a satisfactory concentration of salts in the recycled water. The system equipment is designed and sized to allow unattended operation between inspections, scheduled periodically, at which time routine maintenance is performed and makeup water is added to the system to replace water lost to evaporation.



FLOW DIAGRAM OF THE PROCESS

## WATER RECYCLE SYSTEM

### BACKGROUND OF THE INVENTION

This invention relates generally to household wastewater process and more particularly to a closed purification and recycling system producing both potable water for cooking, drinking and dishwashing and water of appropriate quality for general household washing activities such as washing clothes and personal hygiene. The system includes an incinerator toilet to dispose of body wastes and to incinerate concentrated salts resulting from the distillation.

Conventional water supplies, used in a household for ingestion, dishwashing, washing clothes, for personal hygiene and for flushing toilets are purified to meet drinking water standards. This water is produced by municipal water treatment plant or onsite wells. After being used once for any of the above mentioned purposes, the wastewater is collected in a common drain and flows, generally by gravity, either to a septic system or to a municipal sewage treatment plant where it is treated to remove pollutants and released to a waterway.

Purifying all water entering a family living unit to meet drinking water standards, including water for flushing toilets, for washing clothes and personal hygiene can be expensive and using it only once is wasteful. However, to be safe, all water to be used for cooking, drinking and dishwashing must meet drinking

"unbuildable" because the available water supply is either polluted or inadequate and/or wastewater cannot be disposed of because the land is not suitable for utilization of a septic system or no municipal sewage treatment plants are located nearby. Much of this land would be useable for residential building sites if the water supply and wastewater disposal problems were eliminated. The purpose of the subject invention is to eliminate both of these problems by providing a water purification and recycle system with the capability of producing a continuous supply of water of the required purity to the occupants of single and multiple family living units. No wastewater will be discharged from the purification and recycle system; therefore, no wastewater discharge permits will be required.

### SUMMARY OF THE INVENTION

The water purification and recycle system described in this invention will serve to collect and treat wastewater from various sources in a family dwelling and render the water suitable for reuse in the dwelling. The treatment system will produce two different types of water for reuse: (1) Water suitable for drinking, food preparation and dishwashing and (2) Water suitable for clothes washing and personal hygiene. Body wastes, such as fecal matter and urine, will be processed and disposed of in an incineration toilet and will not be collected for treatment and recycle. These wastes, therefore, will not be intermingled with the recycled water at any time. Exclusion of body wastes from the recycled water will



## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a flow diagram of the process.

### DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIG. 1, an overall flow diagram of a typical system describing the invention is shown.

Clean makeup water is initially introduced into the water storage tank 100 to provide the appropriate amount of water for proper operation of the individual system components. Periodically, makeup water is introduced to compensate for water lost through evaporation, etc.

Pump 24 transfers water from the water storage tank 100 to tank 110 and raises the pressure in tank 110 to about 30 psig to provide adequate water pressure for household use. Water flows from tank 110 through supply line 111 to the bathroom shower, tub, and sinks 10, and laundry 20. Water for ingestion is produced by still 120 which reduces the concentration of dissolved solids to acceptable levels for drinking and food preparation. Feed water is supplied to the still via line 111 from tank 110. Distillate is pumped from still catch tank 120 to the distilled water pressure tank 29 via pump 28. Distilled water is supplied to the kitchen at a pressure of about 30 psig from the distilled water pressure tank 29. Distilled water routed to the kitchen is used for drinking, food preparation and dishwashing. Wastewater from food preparation and dishwashing is small in volume but contains the bulk of the organic pollutants

60 is full. The septic tank has sufficient reserve capacity to hold temporary surges of waste water discharged to the treatment system. Feed water is pumped from the dosing tank 60 on a predetermined time cycle (e.g., hourly) via line 53 by pump 54 through line 55 to the distributing manifold at the top of the biological sand filter 70. The biological sand filter is composed of coarse sand about 27 inches deep supported by gravel. The biological sand filter serves two purposes: (1) filtration of particulate matter from the septic tank effluent and (2) aerobic degradation of residual organic matter by microorganism contained within the interstices of the sand.

During extended periods (e.g. vacations) when no wastewater is discharged from household facilities, water and a nutrient solution will be added to the treatment system to sustain the microorganisms in the biological sand filter. Feeding of the microorganisms will be accomplished by periodically opening valve 14 to allow water to flow to the second septic tank 50 while simultaneously supplying a nutrient solution from the nutrient supply tank 15 via valve 16 to the second septic tank 50. Valves 14 and 16 are activated by the microprocessor which senses the lack of flow to the dosing tank 60. The nutrient solution will contain concentrated biodegradable substances that are appropriate for the treatment system but that will not decompose in the nutrient supply tank 15.

Heat will be supplied to the septic tanks 40 and 50; the dosing tank 60 and the biological sand filter 70 to maximize biological degradation of organic matter in the

1. A process for purifying and recycling household waste waters comprising the following steps:

- (a) collecting a first wastewater stream from household kitchen sources;
- (b) anaerobically digesting said first wastewater stream in a first septic tank;
- (c) collecting a second wastewater stream from household laundry and bathing sources;
- (d) combining water from steps (b), (c), and (h);
- (e) anaerobically digesting water from step (d) in a second septic tank;
- (f) pumping water from step (e) over a biological sand filter under aerobic conditions;
- (g) pumping biologically filtered water from step (f) through an ultrafilter thereby separating the biologically filtered water into a retentate stream and a permeate stream;
- (h) returning said retentate stream to step (d);
- (i) disinfecting said permeate stream;
- (j) returning a first portion of said disinfected permeate stream to household laundry and bathing facilities;
- (k) separating a second portion of said disinfected permeate stream into a low salt portion and a high salt portion;
- (l) returning said low salt portion to a household kitchen; and
- (m) disposing of said high salt portion.

2. The process of claim 1, wherein the anaerobic digestion of step (b) is characterized by a hydraulic retention time of at least about 45 days.

3. The process of claim 1, wherein the disinfection of

# THE PLAN

- Pull Abstracts from 1976-2001
- Run a Doc2Vec
- Observe the frontiers of technology

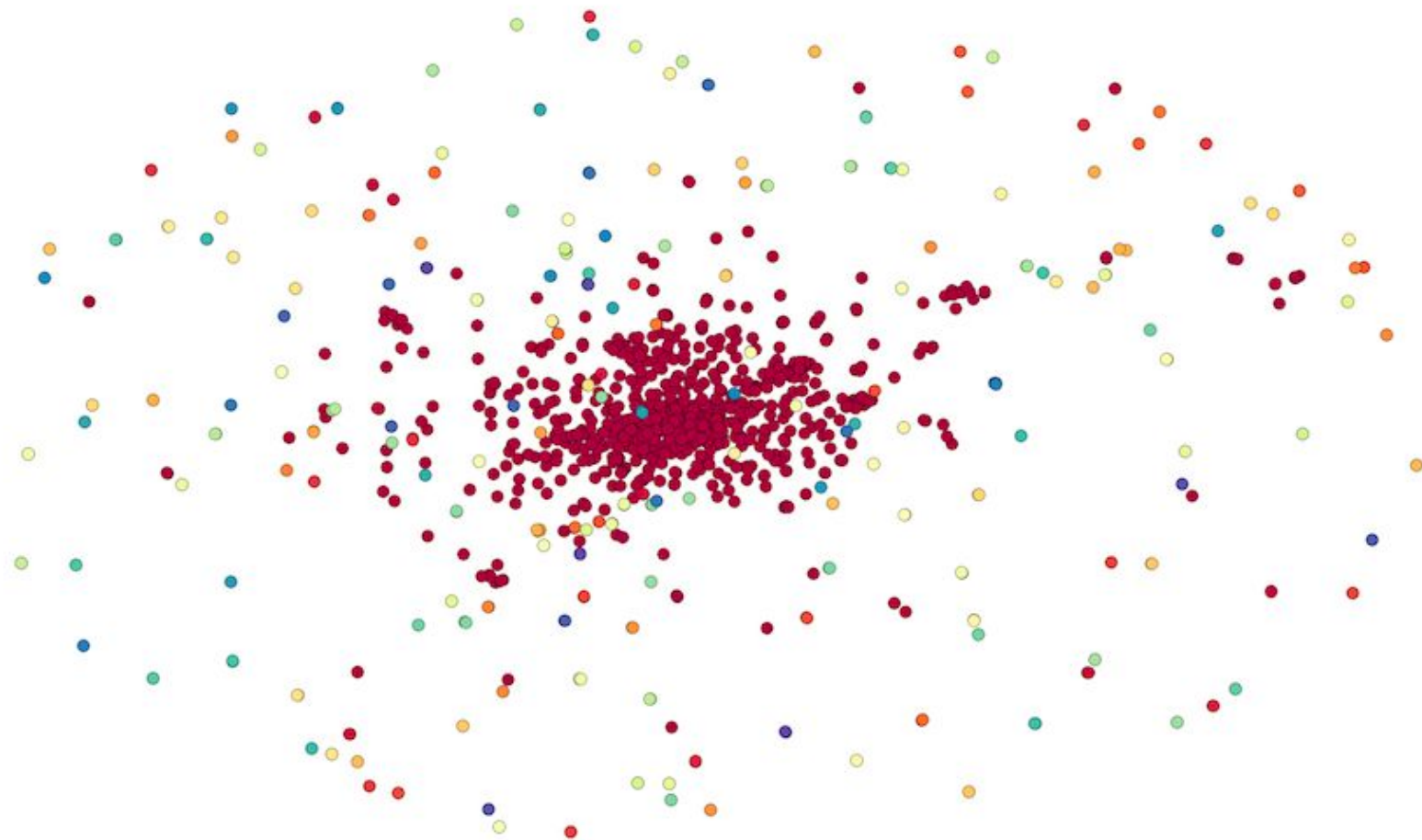
# Problem

1.25 million vectors in 300 dimensions  
overloads memory



## New Plan

Look at 2000 and try to see something interesting



# CLUSTER 10

A method of treating a substrate comprises contacting a surface of said substrate, with a pressurized fluid comprising carbon dioxide and a surface treatment component, the surface treatment component being entrained in the **pressurized fluid** and contacting the surface so that the surface treatment component lowers the surface tension of the surface of the substrate and treats the substrate. The contacting step is preferably carried out by immersion, the **fluid** is preferably a **liquid** or supercritical **fluid**, the substrate is preferably a metal or fabric substrate, and the surface treatment component is preferably a fluoroacrylate polymer.

This hydro-massage chair comprises horizontally-spaced sidewalls, a seat portion extending between the sidewalls, and an inclined back portion adapted to support the back of a patient seated on the seat portion. An inflatable hollow cushion has a back wall bearing against the inclined back portion and a soft front wall facing the back of the seated patient. The cushion is inflated by introducing **liquid** into its interior. **Nozzles** are mounted in spaced relation along the length of the cushion for injecting pressurized **liquid** jets into the interior of the cushion and against the inside of the front wall of the cushion to produce a massaging effect on the back of the seated patient. A plurality of bars spaced apart along the length of the cushion extend between the sidewalls and confine the front wall of the inflated cushion but allow the front wall to bulge slightly in the regions between the bars when the cushion is inflated with **liquid**.

# CLUSTER 3

The present invention relates to novel **hydroxy and polyhydroxy derivatives of coumarin fused with dialdehydes and aldehyde acids** of the general formulae I, II, III and IV: ##STR1## wherein  $R^1 = R^2 = 4\text{-hydroxycoumarin}$ ;

$R^1 = R^2 = 4,7\text{-dihydroxycoumarin}$ ;

$R^1 = R^2 = 4,5,7\text{-trihydroxycoumarin}$ ;

$R^1 = 4\text{-hydroxycoumarin}$ ,  $R^2 = -\text{CH}(\text{OH})\text{CH}_3$ .

An object of the invention are also processes for the preparation of hydroxy and polyhydroxy derivatives of coumarin fused with dialdehydes and aldehyde acids, and the antiviral action thereof.

Novel hydroxy and polyhydroxy derivatives of coumarin according to the present invention exhibit antiviral action against HIV-1 virus.

# CLUSTER 3

Novel N-substituted **azacycloalkyl ring fused 2,3-quinoxalinediones** are disclosed represented by the formula: **##STR1##** or a pharmaceutically acceptable salt thereof, wherein  $R^1$  is hydrogen, alkyl or W-alkyl; X and Y are independently hydrogen, halogen, nitro, cyano, trifluoromethyl,  $SO_2CF_3$ ,  $SO_2R^4$ ,  $SO_2NR^4R^5$ , alkyl, alkenyl,  $(CH_2)_zCONR^4R^5$ ,  $(CH_2)_zCOOR^4$ , or  $NHCOR^4$ , wherein  $R^4$  and  $R^5$  are independently hydrogen, alkyl having 1 to 6 carbon atoms, cycloalkyl or W-alkyl, and z is an integer from 0 to 4;  $R^2$  is benzoyl, W, W-alkyl, COcycloalkyl, COalkyl-W,  $CONR^3$  alkyl,  $CONR^3-W$ ,  $CONR^3$  alkyl-W,  $CSNR^3$  alkyl,  $CSNR^3$  alkyl-W, **##STR2##** or a moiety derived from a common amino acid by removal of the -OH from the carboxyl group which is alpha to the amino, wherein -W is aryl, heteroaryl, or the heterocycles piperidinyl, piperazinyl, morpholinyl or pyrrolidinyl, wherein  $R^3$  is hydrogen, alkyl or W-alkyl; and m and n are independently 0, 1 or 2 provided that  $m+n$  is  $>1$ ; provided that when  $R^2$  is benzoyl, **##STR3##** or X is nitro, Y and  $R^1$  are H, m is 2 and n is 1;

when  $R^2$  is **##STR4##** X is nitro, Y and  $R^1$  are H and m is 2 and n is 1; or when  $R^2$  is **##STR5##** X is bromo, Y and  $R^1$  are H, m is 1 and n is 2. The novel N-substituted azacycloalkyl ring fused 2,3-quinoxalinediones may be used, for example, as neuroprotective agents, for treatment of chronic neurodegenerative disorders, as anticonvulsants and in the treatment of schizophrenia, epilepsy, anxiety, pain and drug addiction.



## CLUSTER 3

**1,2,4-thiadiazine and 1,4-thiazine** derivatives represented by formula (I) wherein A, B, D, R<sup>1</sup>, R<sup>2</sup>, R<sup>3</sup> and R<sup>4</sup> are defined in the description, compositions thereof and methods for preparing the compounds are described. The compounds are useful in the treatment of diseases of the central nervous system, the cardiovascular system, the pulmonary system, the gastrointestinal system and the endocrinological system.

## PATENT NUMBER 6050936: CLUSTER 43

An apparatus for treatment of a failing heart by reducing the wall tension therein. In one embodiment, the apparatus includes a tension member for drawing at least two walls of a heart chamber toward each other.

PATENTS 6045497, 5961440, 6165120,  
6162168

An apparatus for treatment of a failing heart by reducing the wall tension therein. In one embodiment, the apparatus includes a tension member for drawing at least two walls of a heart chamber toward each other. Methods for placing the apparatus on the heart are also provided.

## CLUSTER 165

A connector waterproofing stopper includes a tubular part which in turn has a seal portion in one half thereof and a connecting portion in the other half thereof. The connecting portion has an annular engaging rib in the end portion of the outer peripheral surface thereof. The annular engaging rib includes an engaging surface and, on the opposite side of the engaging surface, a tapered reinforcing portion which extends from the top portion of the annular engaging rib toward the axial direction of the connecting portion. When an external force to pull an electric wire is given to the annular engaging rib, the reinforcing portion prevents the annular engaging rib from inclining to thereby maintain the engagement between the engaging surface and an electric wire connecting terminal.

# CLUSTER 165

A waterproof connector includes an inner housing, an outer housing, a rubber plug and a spacer. The inner housing includes a plurality of terminal accommodation chambers, and a terminal is accommodated in each of the terminal accommodation chambers. The inner housing is fitted into the outer housing. The outer housing includes a first wall. The first wall includes a rubber plug accommodation recess which opens inside the outer housing, and a first insertion hold bringing the rubber plug accommodation recess and the outside into communication with each other. The rubber plug includes a third insertion hole, and is inserted in the rubber plug accommodation recess. The spacer is disposed between the inner housing and the outer housing for holding the terminals accommodated in the terminal accommodation chamber. The spacer includes a second wall between the terminal accommodation chamber and the first wall. The second wall includes a second insertion hole. The terminals in the terminal accommodation chambers are connected to electric wires. Each of the electric wires passes through the first, third and second insertion holes. The terminal accommodation chambers and the electric wires are sealed by the rubber plug.



# Clustered

A plant packaging system comprising a combination of a protective sleeve portion and a decorative cover portion having a base and skirt for packaging a potted plant. The protective sleeve can be detached from the decorative portion of the package system once the protective function of the sleeve has been completed, thereby exposing the decorative cover and allowing the skirt portion to extend angularly from the base. The protective sleeve and decorative cover components may comprise a unitary construction or may comprise separate components which are attached together by various bonding materials.

A method for covering a pot, the cover is a flattened sleeve comprising a base portion sized to fit a pot and having an upper portion which is detachable leaving an upper edge and a closed bottom in the base. The cover may be bondingly connected to or crimped about the pot.



# Conclusions

Patents are diverse

What next?

Considering getting a patent? Look over cosine .5 patents.

# Questions