



## **AUTOMATIC PLANT WATERING SYSTEM**

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& Sergey Stankevich

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<b>Mission Statement: Automatic Plant Watering System</b>	
Product Description	<ul style="list-style-type: none"> <li>• Portable with adjustable frequency and amount of water delivered, low water level indicator</li> </ul>
Key Business Goals	<ul style="list-style-type: none"> <li>• Fit all kinds of home plants</li> <li>• Capture 60% of home gardening sales in primary market</li> <li>• Serve as primary product in the home gardening industry</li> <li>• Environmental friendly</li> <li>• First product introduction 4<sup>th</sup> Q 2002</li> </ul>
Primary Market	<ul style="list-style-type: none"> <li>• Houseplants</li> </ul>
Secondary Market	<ul style="list-style-type: none"> <li>• Offices</li> <li>• Small garden stores</li> </ul>
Assumptions and Constrains	<ul style="list-style-type: none"> <li>• New product platform</li> <li>• Digital technology</li> </ul>
Stakeholders	<ul style="list-style-type: none"> <li>• Purchases and users</li> <li>• Manufacturing operations</li> <li>• Service operations</li> <li>• Distributors and resellers</li> </ul>

### Customer data template.

<b>Customer:</b>	Julie Calabia	<b>Interviewer(s):</b>	Jacek Taper
<b>Address:</b>	56-13 Metropolitan Ave Maspeth NY, 11378	<b>Date:</b>	April 11, 2002
<b>Telephone:</b>	718-8947129	<b>Currently uses:</b>	None
<b>Willing to do follow-up?</b>	Yes	<b>Type of user:</b>	Travel agent
<b>Question/Prompt</b>	<b>Customer Statement</b>	<b>Interpreted Need</b>	
Typical Use    Typical Use	I need to water my plants.  I travel a lot; have to leave plants at home.	WPD waters plants automatically  It needs to have enough water for a long period of time.	
Likes- Current tool	Simple and easy to use. Works quietly.		
Dislikes-Current tool	I don't like the way it looks. It's too complicated. It's hard to use it.  I don't know how much water is left in the container.	WPD is small and green. WPD is simple to setup and easy to use.  It uses LED to indicate low water level.	
Suggested improvements	Would be nice if it could water more than just one flower at a time.  A device that allows to water according to the cording to the soil moisture.	WPD allows you to connect up to 3 plant pots for watering.  WPD can measure the moisture and keep it constant.	

**Hierarchical list of primary and secondary customer needs for automatic watering plant device.** 5

**The WPD provides enough water to water a mid-size plant.**

- \* The WPD has a container large enough to last for a week.
- \*\*\*The WPD is more accurate and precise than doing it manually.
- \*\* Customer can use any pot.

**The WPD is easy to set up.**

- \* The WPD is easy to turn on.
- \*\* The WPD easy to operate.
- \*\*\*The WPD stays online all the time.

**The WPD's power is convenient.**

- \* The WPD can use AC or/and DC power.
- \*\* The WPD indicates when a battery is low.

**The WPD lasts long time.**

- \* A battery should provide enough power to run the WPD and last at least one month
- \*\* The WPD does not contain any fragile parts that may break.

**WPD is easy to set up and use.**

- \* The WPD is easy to turn on.
- \*\* Customer can easily adjust the amount of water delivered
- \*\*\* The WPD indicates low water level.

**The WPD is easy to store.**

- \* The WPD is light and small.
- \*\* The WPD resists corrosion when left outside or in a damp place.
- \*\* The WPD can be dropped from a ladder without a damage.

**The WPD prevents damage to the plants.**

- \*\* The WPD prevents water overdose.
- \* The WPD indicates low water level

**The WPD has a pleasant sound when in use.**

**The WPD looks like a professional quality device.**

**The WPD is safe.**

- \*\*\*The WPD does not destroy user's plants.



### Automatic Plant Watering System Survey

For each of the following plant watering system features, please indicate on a scale of 1 to 5 how important the feature is to you.

*Please use the following scale:*

1. *Undesirable. I would not consider product with this feature.*
2. *Not important. I would not mind having it.*
3. *Would be nice to have*
4. *Highly desirable. I would consider product without it.*
5. *Critical. I would not consider product without this feature.*

\_\_\_\_\_ The plant watering system is supplying water up to three flowers at the same time.

\_\_\_\_\_ The plant watering system is plugged into electrical outlet instead of batteries.

\_\_\_\_\_ The plant watering system indicates low water level.

\_\_\_\_\_ The plant watering system is quiet when in use.

\_\_\_\_\_ The plant watering system allows you to adjust the amount of water delivered to the flower.

\_\_\_\_\_ The plant watering system allows you to adjust the time how often the flower is watered.



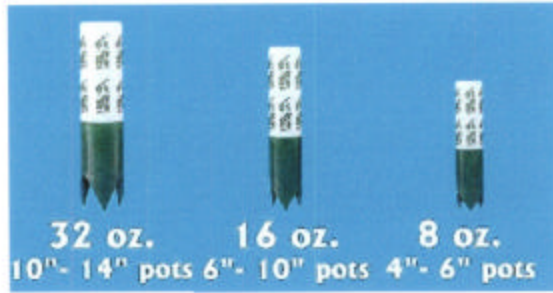
### Competitive Benchmarking

No.	Needs	Imp	Rain Maid	Plant-sitter	E-garden	Drip mist
1	Lasts a long time	5	***	**	**	***
2	Safe in use	5	.	***	.	**
3	Can be maintained with readily available tools	1	****	.	**	***
4	Allows easy replacement of worn parts	1	***	**	***	***
5	Can be easily accessed for maintenance	1	***	.	***	****
6	It is not contaminated by water	5	****	***	****	****
7	Light weight	3	****	**	***	**
8	Fits a wide variety of household plants	4	.	****	**	**
9	Can deliver desired amount of water	5	.	****	**	**
10	Affordable for household	5	***	.	**	***
11	Easy to set up and use	1	****	**	***	***





### Competitive Benchmarking



Automatic Plant Sitter



Drip Mist



E-Garden



US006185866B1



(12) **United States Patent**  
**Enfaradi**

(10) **Patent No.:** **US 6,185,866 B1**  
(45) **Date of Patent:** **Feb. 13, 2001**

(54) **PLANT WATERER APPARATUS**

(76) **Inventor:** **Abbas Enfaradi**, P.O. Box 18927,  
Atlanta, GA (US) 31126

(\* ) **Notice:** Under 35 U.S.C. 154(b), the term of this  
patent shall be extended for 0 days.

(21) **Appl. No.:** **09/066,795**

(22) **Filed:** **Apr. 27, 1998**

(51) **Int. Cl.<sup>7</sup>** ..... **A01G 25/00**

(52) **U.S. Cl.** ..... **47/79; 47/48.5**

(58) **Field of Search** ..... **47/79, 48.5**

(56) **References Cited**

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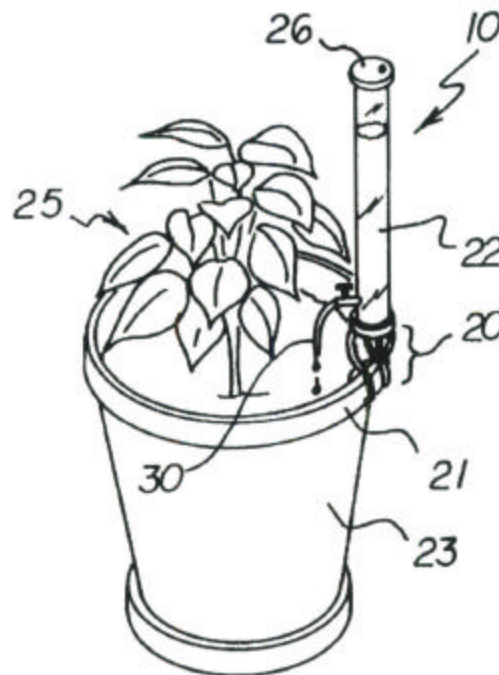
\* cited by examiner

*Primary Examiner*—Michael J. Carone  
*Assistant Examiner*—Joanne C. Downs

(57) **ABSTRACT**

A plant waterer apparatus includes a water container which includes a top container portion and a bottom container portion. A valve assembly is connected to the bottom container portion and is in communication with an interior of the water container. A clamp assembly is connected to the bottom container portion and is used for clamping the apparatus onto a rim of a pot which contains a plant. The water container includes a transparent container wall, and the transparent container wall includes indicia of volume. A container cap is attached to the top container portion, and the container cap includes an access channel. A drip hose is connected to the valve assembly. The water container and the clamp assembly are located symmetrically around a longitudinal axis. The clamp assembly includes a first clamping member and a second clamping member connected to the bottom container portion. The first clamping member includes a first clamp offset region which extends away from the longitudinal axis, and the second clamping member includes a second clamp offset region which extends away from the longitudinal axis and away from the first clamp offset region. When the clamp assembly is clamped onto a pot, the rim is clamped between the first clamp offset region and the second clamp offset region. The first clamping member and the second clamping member are made from spring wire. The valve assembly includes an externally operated valve handle and an internally controlled ball valve.

**10 Claims, 3 Drawing Sheets**



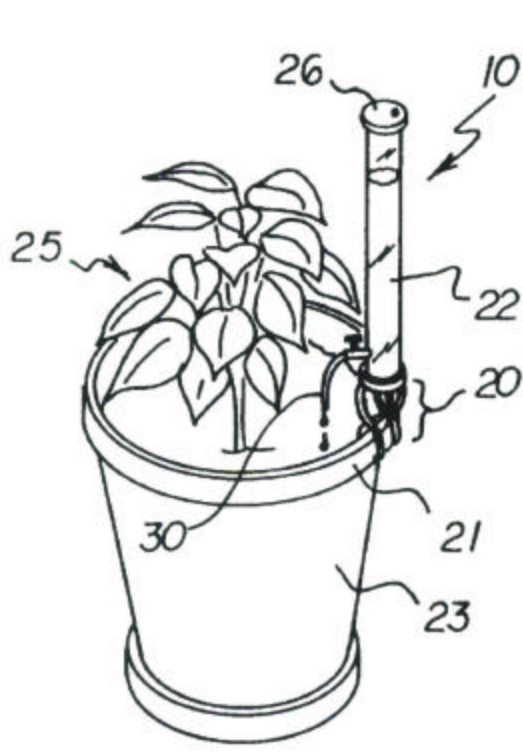


FIG 1

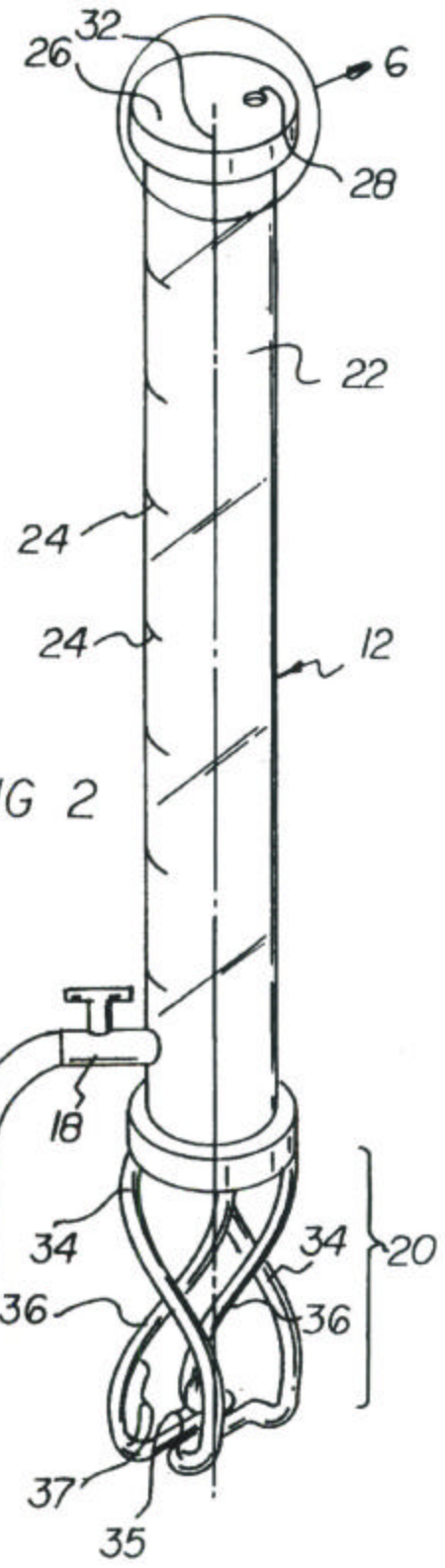


FIG 2



US00D333763S

**United States Patent** [19]  
**Collins**

[11] **Patent Number: Des. 333,763**  
[45] **Date of Patent: \*\* Mar. 9, 1993**

- [54] **PLANT WATERER**
- [76] **Inventor: Rita Collins, 2462 N. Nye #131, Fremont, Nebr. 68025**
- [\*\*] **Term: 14 Years**
- [21] **Appl. No.: 654,555**
- [22] **Filed: Feb. 12, 1991**
- [52] **U.S. Cl. .... D8/1; D23/200**
- [58] **Field of Search .... 47/48.5, 59, 79-81; 222/187, 561, 566; 239/10, 37, 43, 63, 128, 315, 565, 38, 34; D23/200; D8/1**

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*Primary Examiner*—Wallace R. Burke  
*Assistant Examiner*—M. H. Tung  
*Attorney, Agent, or Firm*—Terry M. Gernstein

[57] **CLAIM**

The ornamental design for plant waterer, as shown and described.

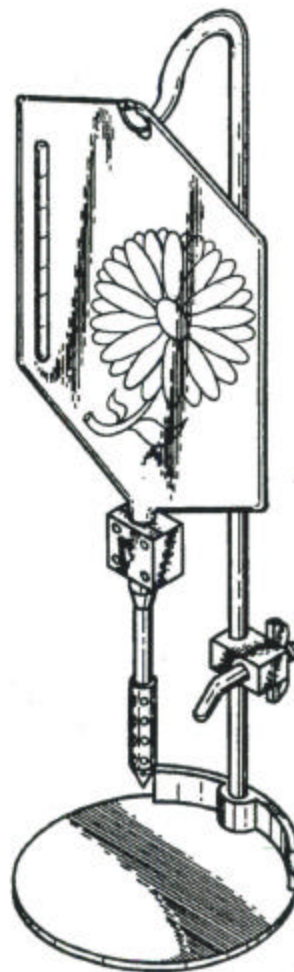
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**DESCRIPTION**

FIG. 1 is a perspective view of a plant waterer showing my new design;  
FIG. 2 is a front elevational view thereof;  
FIG. 3 is a rear elevational view thereof;  
FIG. 4 is a side elevational view thereof, the opposite side being a mirror image;  
FIG. 5 is a top plan view thereof; and,  
FIG. 6 is a bottom plan view thereof.



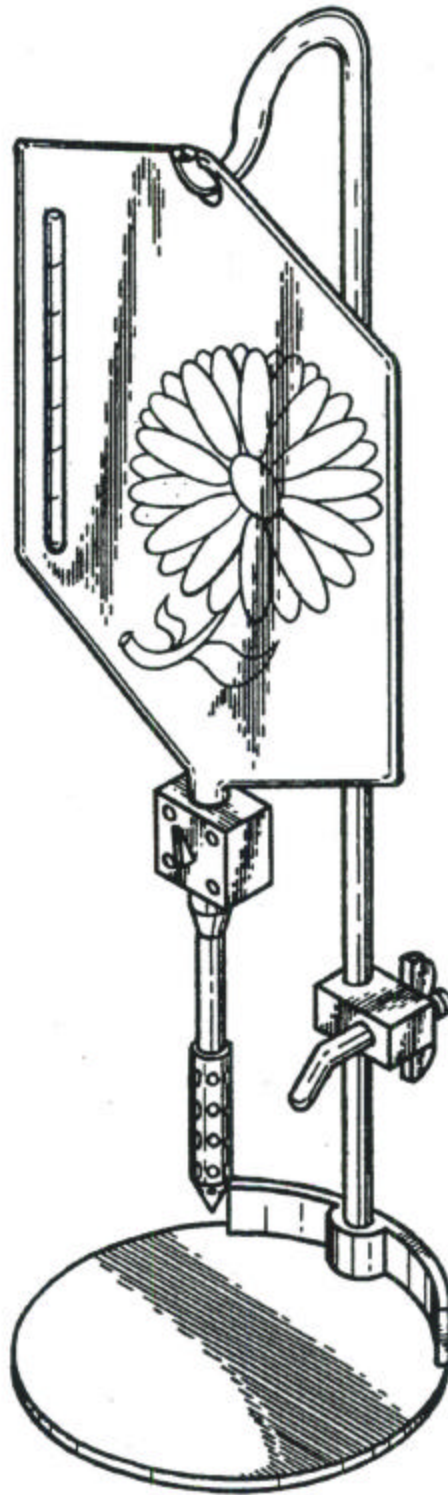


FIG 1

**United States Patent** [19]  
**Raczkowski**

[11] **Patent Number:** 4,843,758  
 [45] **Date of Patent:** Jul. 4, 1989

[54] **REGULATED AUTOMATIC PLANT WATERER**

[76] **Inventor:** Romuald Raczkowski, 6240 N. Naper, Chicago, Ill. 60631

[21] **Appl. No.:** 123,714

[22] **Filed:** Nov. 23, 1987

[51] **Int. Cl.<sup>4</sup>** ..... A01G 27/00

[52] **U.S. Cl.** ..... 47/48.5; 47/79; 47/80

[58] **Field of Search** ..... 47/79, 80, 81, 48.5, 47/82, 83

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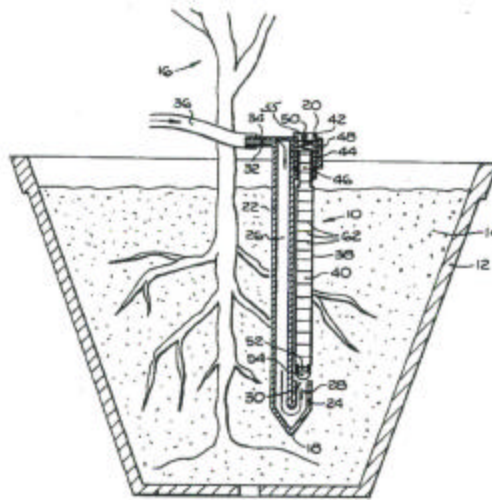
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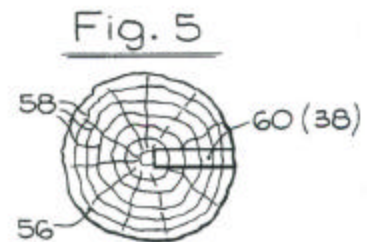
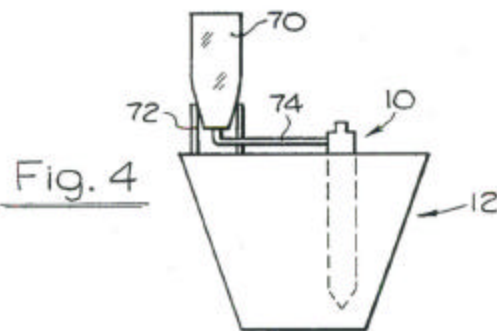
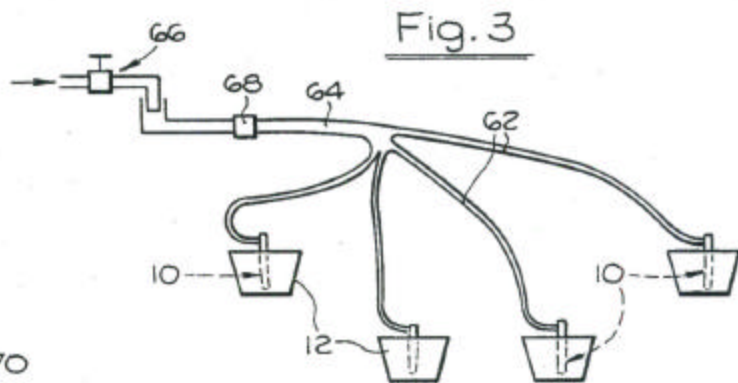
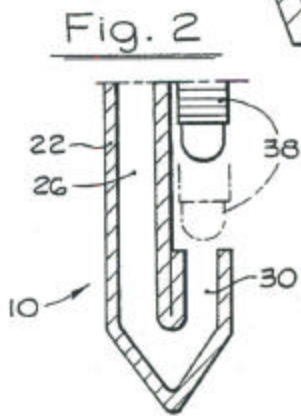
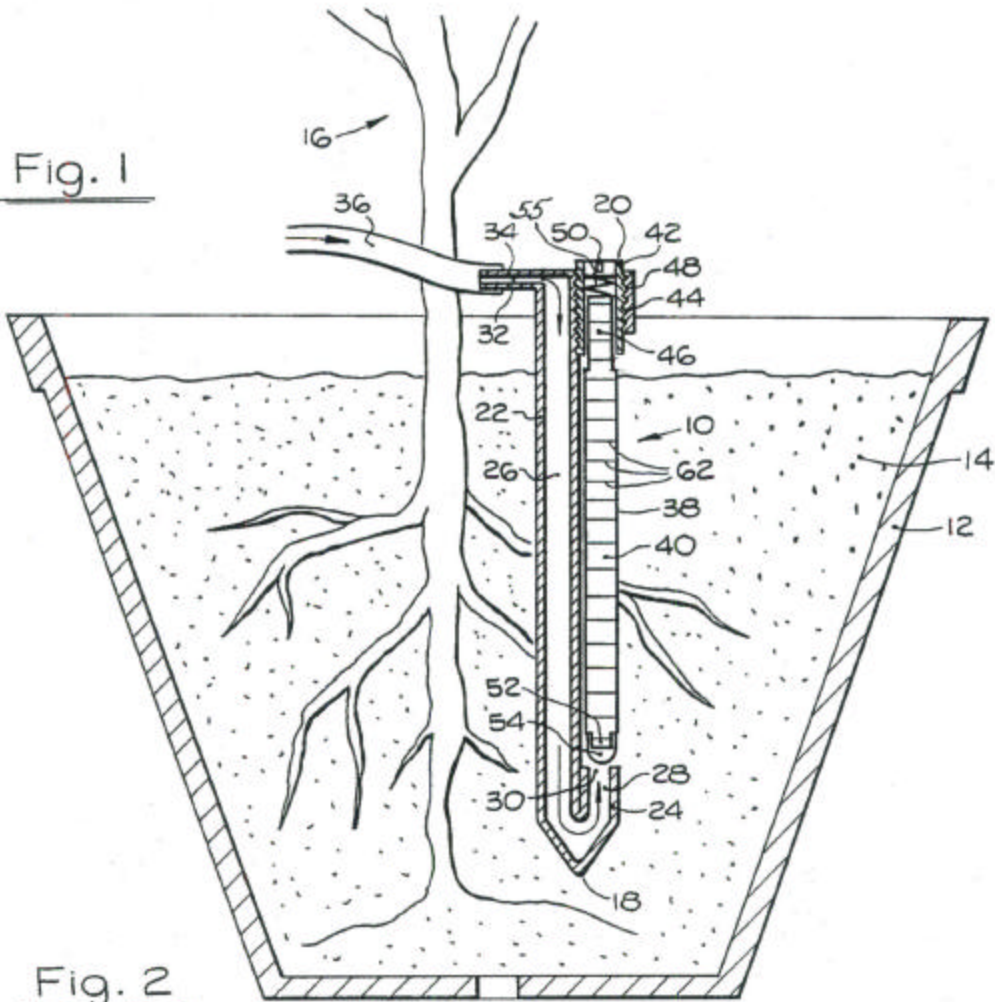
*Primary Examiner*—Robert A. Hafer  
*Assistant Examiner*—Kevin G. Rooney  
*Attorney, Agent, or Firm*—Paul H. Gallagher

[57] **ABSTRACT**

A spike shaped for driving into the soil, has a vertical tube having an upturned lower portion terminating in an upwardly port. The spike has an element for connection with a water supply. It has a closer mounted at the top and its lower end adjacent the port, and restricting the port upon expanding caused by the moisture in the soil. The closer is made of wood cut across the grain in a tree limb. In a modified form, water is supplied by a jar mounted on the pot in which the plant is located. A plurality of devices may be used for a plurality of plants, supplied with water from branches of a common water line, and the device responding and controlling individually.

**3 Claims, 1 Drawing Sheet**







US005279071A

# United States Patent [19] McDougall

[11] Patent Number: **5,279,071**  
[45] Date of Patent: **Jan. 18, 1994**

- [54] **AUTOMATIC TREE AND/OR PLANT WATERER**
- [76] Inventor: **Dale McDougall, R.R. #1, Sackville, New Brunswick, Canada, E0A 3C0**
- [21] Appl. No.: **753,042**
- [22] Filed: **Aug. 30, 1991**
- [51] Int. Cl.<sup>5</sup> ..... **A47G 7/02**
- [52] U.S. Cl. .... **47/40.5; 47/79; 47/82**
- [58] Field of Search ..... **47/40.5, 79, 82**
- [56] **References Cited**

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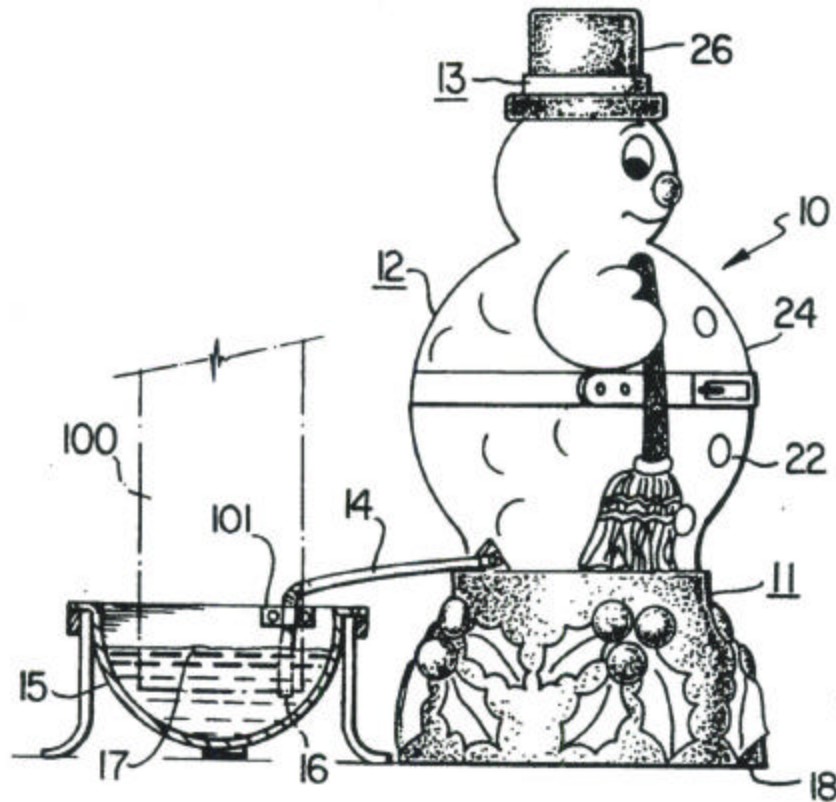
Primary Examiner—Carl D. Friedman  
 Assistant Examiner—Wynn Wood  
 Attorney, Agent, or Firm—Martin J. Marcus

### [57] ABSTRACT

A novel automatic tree waterer is provided herein. It is

adapted to be connected to a stand which holds a tree, e.g. a Christmas tree, in an upright position. The waterer includes a hollow support base and a hollow two-piece body section. The lower body section is assembled to the support base by means of a slide coupled lip/coupling support lip to be airtight and watertight. The upper body section is assembled to the lower body section by means of male/female threads to be airtight and watertight. The upper body includes a male threaded upper neck. A hat including an inner well with interlock threads is assembled to the upper body by means of the male/female threads to be airtight and watertight. A water outlet is provided from the interior of the body section. A flow controller unit is connected to the water outlet to close the water outlet to enable filling the interior of the hollow two-piece section with water. A hose is adapted to be connected between the flow controller and the stand which holds the tree. Once the flow of water is commenced, a cyclic automatic flow of water ensues. The water will not flow unless air is allowed to enter through the tube. Thus, when the end of the tube is submerged in water, no water can flow.

6 Claims, 3 Drawing Sheets

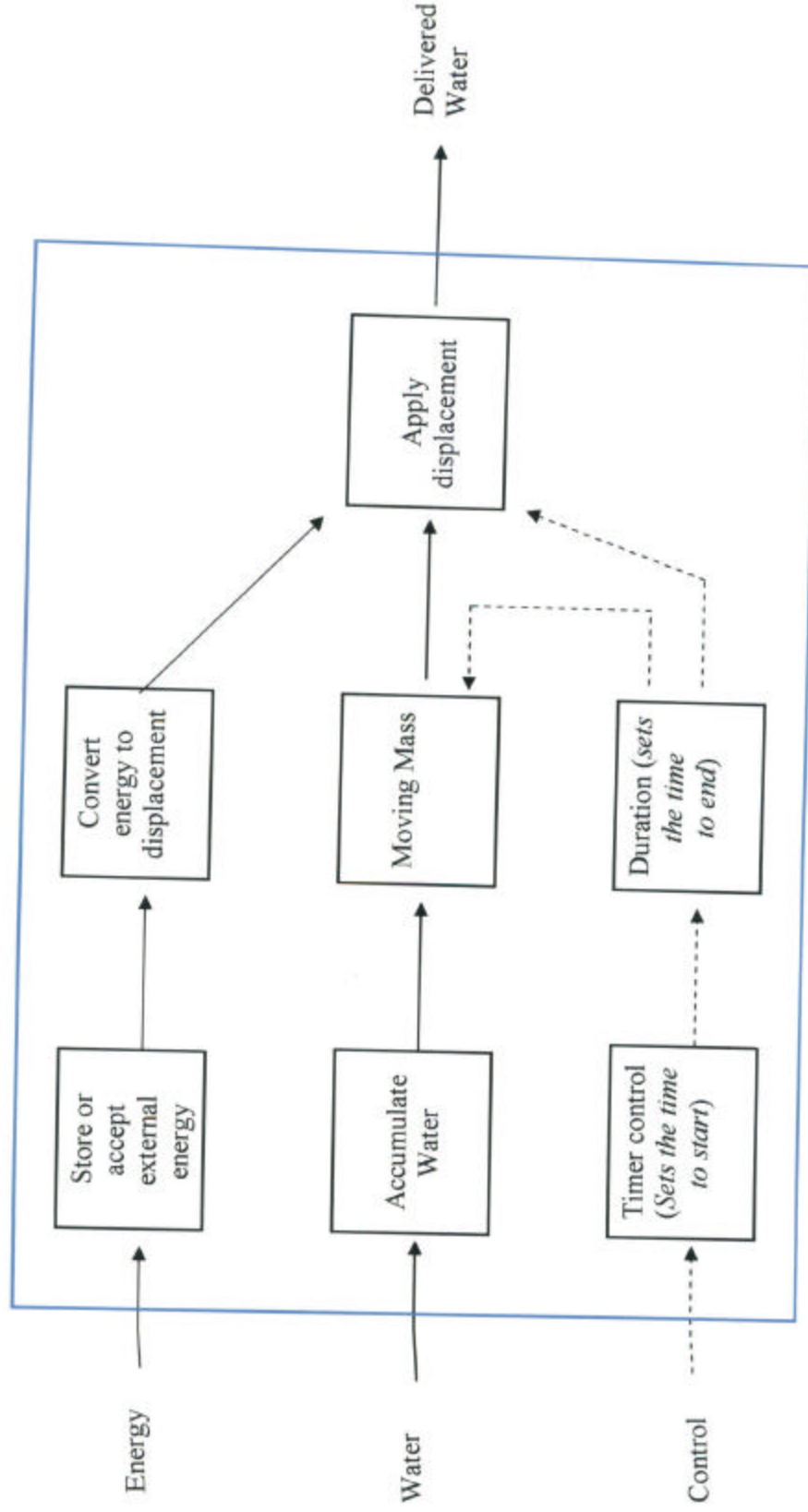




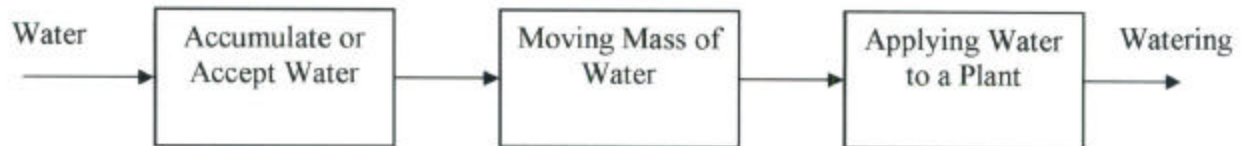
### Target Specification

Metric No.	Need No.	Metric	Imp.	Units	Marginal Value	Ideal Value
1	1,2	Bending Strength	5	KN	>5	>8
2	1	UV test duration to degrade rubber parts	5	Hours	>250	>450
3	3	Special tools required for maintenance	1	List	Hex	Hex
4	4,5	Time for disassemble/assemble for maintenance	1	s	>400	>160
5	6	Time in spray chamber without water entry	5	s	Infinity	Infinity
6	7	Total mass	3	kg	>1.5	>.5
7	8	Plants require lots of water	4	L	>1.5	>3
8	8	Plants requiring almost no water	4	L	>1.5	>3
9	9	Dosage	5	Days	.5 to 7	.3 to 31
10	10	Manufacturing costs	5	US\$	<30	<20
11	11	Time to assemble to a plant	1	s	>60	>60

# Function Diagram



### Problem Decomposition and Concept Combination Table



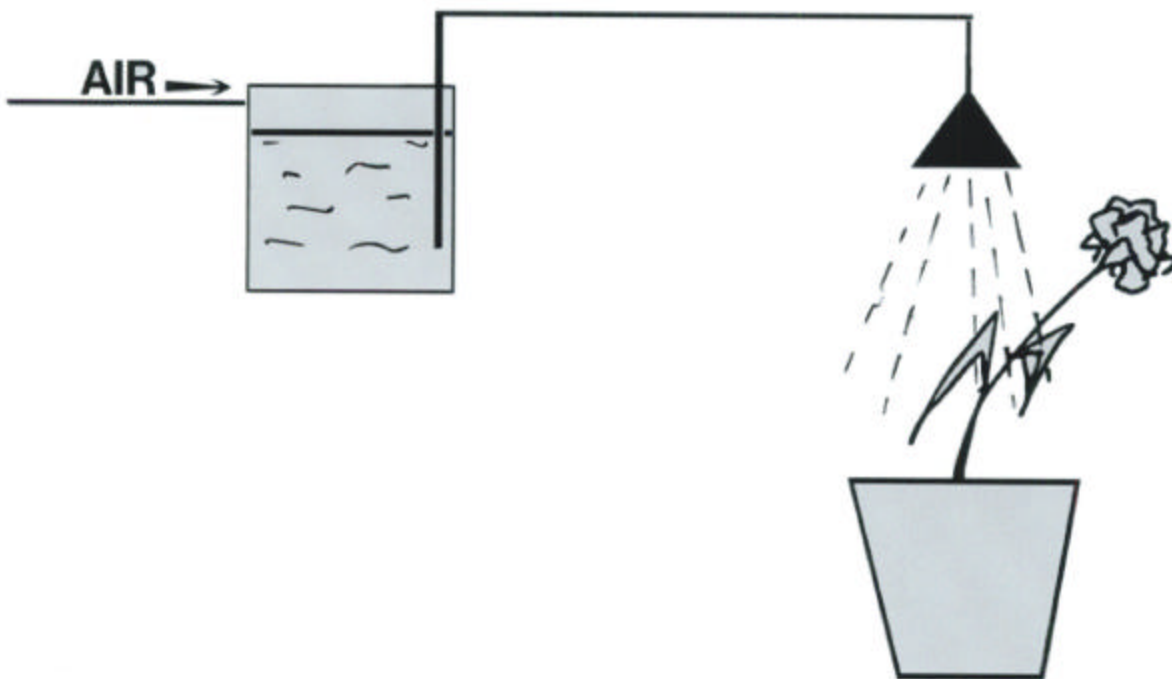
Problem decomposition assuming water source and the accumulation of water in the mechanical domain.

<b>Accumulate or Accept Water</b>	<b>Moving Mass of Water</b>	<b>Applying Water to a Plant</b>
Store water in a container	Pump	Single release
Accept from the kitchen's top	Water Pressure	Dripping
Collect the rain	Air pressure	Spraying
		Sprinkling

Concept Combination Table

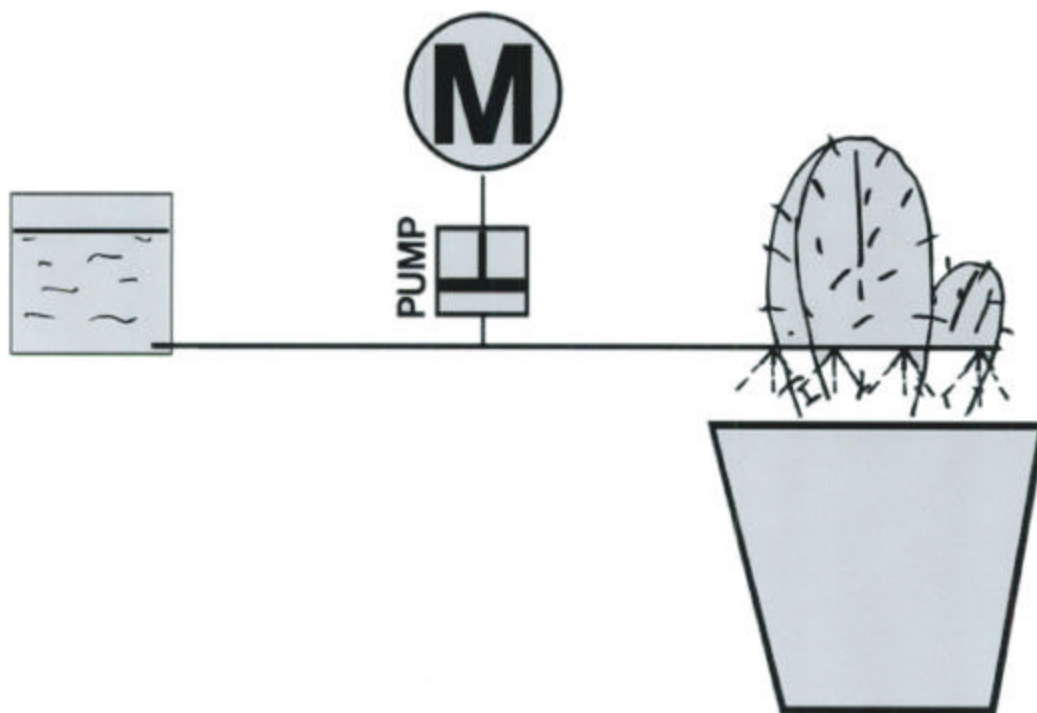
### Concept A : Air Pressure

Accumulate or Accept Water	Moving Mass of Water	Applying Water to a Plant
Store water in a container	Pump	Single release
Accept from the kitchen's top	Water Pressure	Dripping
Collect the rain	Air pressure	Spraying
		Sprinkling



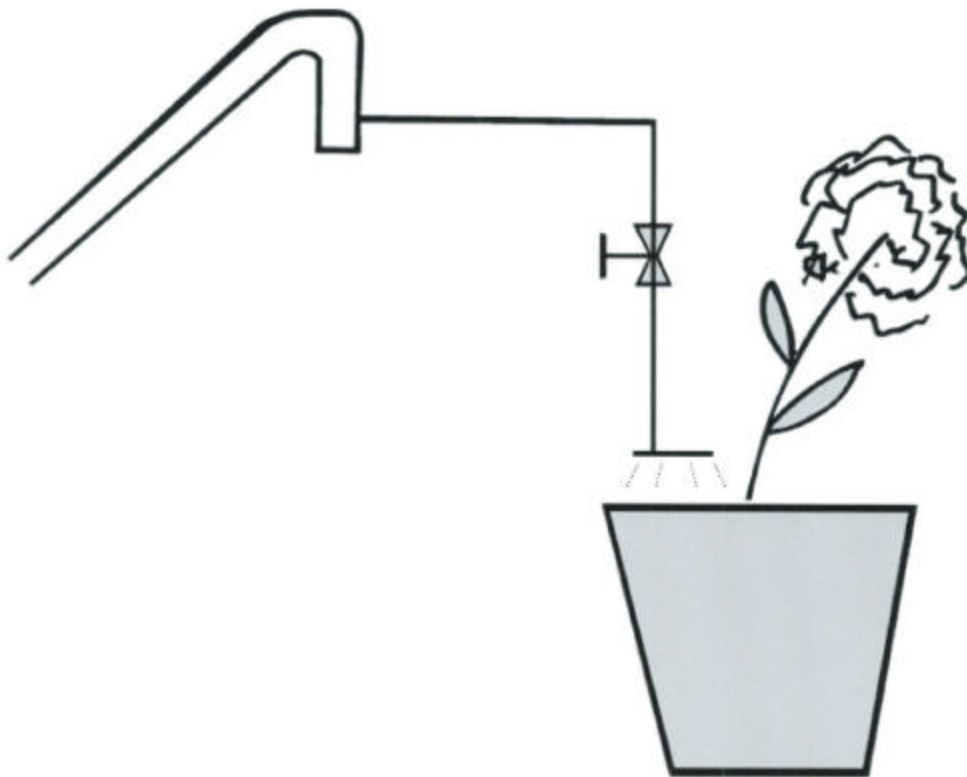
### Concept B: *Water Pump*

Accumulate or Accept Water	Moving Mass of Water	Applying Water to a Plant
Store water in a container	Pump	Single release
Accept from the kitchen's top	Water Pressure	Dripping
Collect the rain	Air pressure	Spraying
		Sprinkling



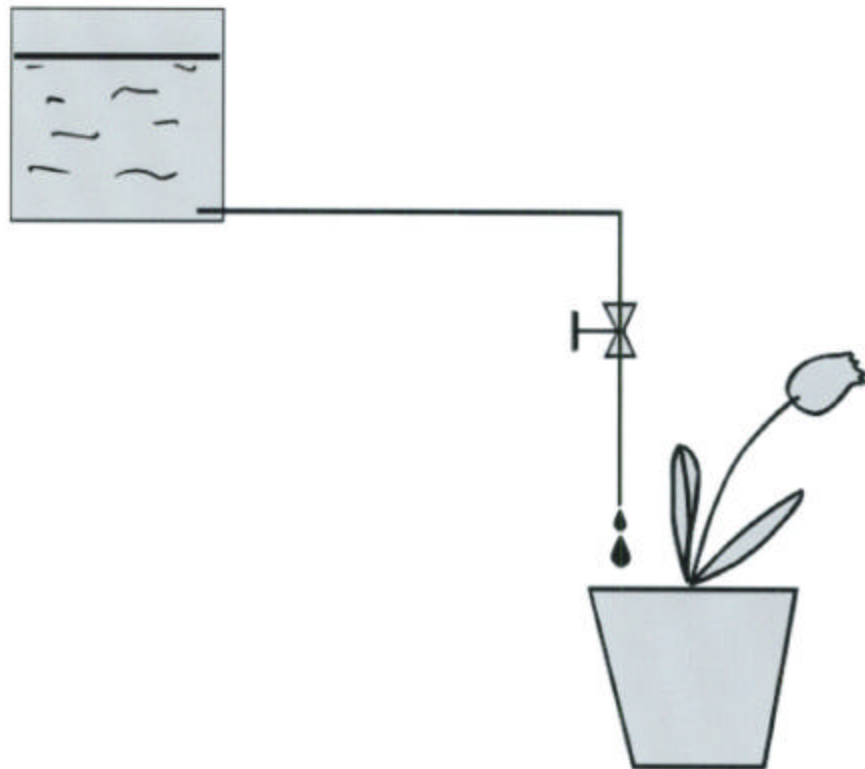
**Concept C: Water pressure (kitchen top)**

Accumulate or Accept Water	Moving Mass of Water	Applying Water to a Plant
Store water in a container	Pump	Single release
Accept from the kitchen's tap	Water Pressure	Dripping
Collect the rain	Air pressure	Spraying
		Sprinkling



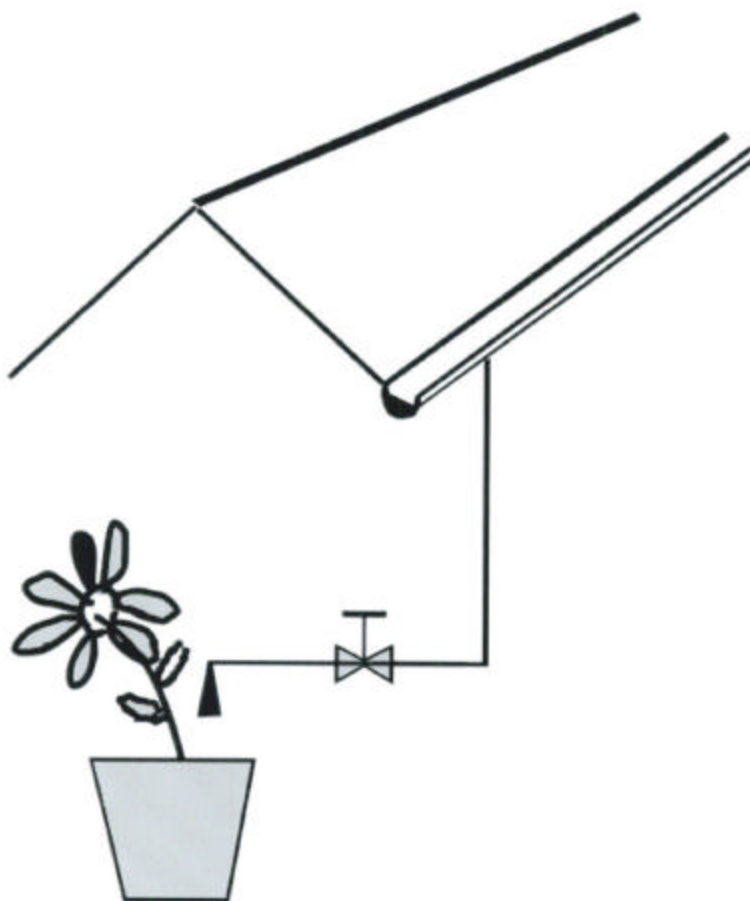
**Concept D: Water pressure (gravity)**

Accumulate or Accept Water	Moving Mass of Water	Applying Water to a Plant
Store water in a container	Pump	Single release
Accept from the kitchen's tap	Water Pressure	Dripping
Collect the rain	Air pressure	Spraying
		Sprinkling



**Concept E: *Water pressure (collect the rain)***

Accumulate or Accept Water	Moving Mass of Water	Applying Water to a Plant
Store water in a container	Pump	Single release
Accept from the kitchen's top	Water Pressure	Dripping
Collect the rain	Air pressure	Spraying
		Sprinkling





### Concept Screening

	Concepts				
	A	B	C	D	E
Selection Criteria	Air Pressure	Water Pump	Water Pressure (Kitchen top)	Water Pressure (gravity)	Water Pressure (collect the rain)
Ease of handling	+	+	+	-	-
Ease of use	+	+	-	-	0
Readability of setting	-	+	-	+	0
Dose metering accuracy	0	+	+	0	-
Durability	0	0	-	+	-
Ease of manufacture	0	0	+	+	-
Portability	+	+	-	-	-
Sum +'s	3	5	3	3	0
Sum 0's	3	2	0	1	2
Sum -'s	1	0	4	3	5
Net Score	2	5	-1	0	-5
Rank	2	1	4	3	5
Continue?	Yes	Yes	No	Revise	No

### Concept Scoring

		Concepts					
		A Air Pressure		B Water Pump ( Reference )		D Water Pressure (Gravity)	
Selection Criteria	Weight	Rating	Weighted Score	Rating	Weighted Score	Rating	Weighted Score
Ease of handling	15%	3	.45	4	.6	2	.3
Ease of use	20%	2	.4	3	.6	2	.4
Readability of setting	15%	3	.45	5	.75	3	.45
Dose metering accuracy	10%	2	.2	5	.5	3	.3
Durability	15%	2	.3	3	.45	3	.3
Ease of manufacture	10%	2	.2	3	.3	3	.3
Portability	15%	3	.45	5	.75	2	.3
	Total Score	2.45		3.95		2.35	
	Rank	2		1		3	
	Continue?	No		Develop		No	

### Concept Testing

#### CONCEPT TEST SURVEY-Watering Plant Device

I am gathering information for a new watering device and am hoping that you would be willing to share your opinions with me.

Do you own any plants? \_\_\_\_\_

<If the answer is no, thank the respondent and end the survey.>

How many plants do you have? \_\_\_\_\_

How often do you water your plants?

Once in a day \_\_\_\_\_ Twice in a day \_\_\_\_\_ Once in two days \_\_\_\_\_ Other \_\_\_\_\_

Have you ever missed watering? \_\_\_\_\_

How much water do you use? \_\_\_\_\_

Do you use the same amount of water every time? \_\_\_\_\_

Here is the brochure for the product. <Show the brochure.>

The product is a watering plant device that water plants as often as needed and amount of water desired for every plant. The WPD can water your plants as frequently as every 12 hours and rarely as every 7 days. A light indicator will let you know that the water container is empty. It has a safety feature, that will turn off the watering in case of too much water in the plant. The WPD can work from the standard outlet 115V AC. The WPD is easy to operate, maintain and it is easy to control.

If the product were priced at \$49.99 and were available from your local house improvement store, how likely would you be to purchase the WPD ?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I would definitely not purchase the WPD	I would probably not purchase the WPD	I might or might not purchase the WPD	I would probably purchase the WPD	I would definitely purchase the WPD

Would you be interesting in testing a prototype of the product?

<Provide operating instructions and give a short presentation>

Based on your experience with the product, how likely would you be to purchase the product within next year?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I would definitely not purchase the WPD	I would probably not purchase the WPD	I might or might not purchase the WPD	I would probably purchase the WPD	I would definitely purchase the WPD

How might this product be improved?

<Ask open-ended questions to elicit feedback on the concept.>

**Differentiation Plan**








<b>Differentiating Attributes</b>	<b>Home</b>	<b>Office</b>	<b>Hothouse</b>
Power supplied	AC	AC	AC
Power of the motor	2 W	10 W	2 KW
Container size	4in x 4in x 7in	10in x 10in x 20in	50in x 80in x 150in
Volume of the pump	.1 gallon per minute	.5 gallons per minute	10 gallons per minute
Diameter of the pipe	1/4 in.	1/2 in.	2 in.
Number of Plants	1 plant	3 plants	100 plants
Connectivity to computer	Parallel port	Parallel port	Parallel port
Operating system compatibility	Windows	Windows	Windows
Stile	"House"	"Office"	"Commercial"








### Differentiation and Commonality

Chunks	Number of types	House	Office	Hothouse
Motor	3	2 W	10 W	2 KW
Pump	2	.1 gallon per minute	.5 gallons per minute	10 gallons per minute
Container & Logic board Enclosure	3	Home style	Office style	Commercial style
Pipe	2	Vinyl	Vinyl	Vinyl & Metal
Logical board	2	Soldered	Soldered	Printed
Timer	1	555	555	555
Low water sensor	1	LED	LED	LED
Overflow sensor	1	AND Gate	AND Gate	AND Gate

### Industrial Design for WPD

Needs	Level of Importance	Explanation of Ratings
<b>Ergonomics</b> Ease of use	Low                  Medium                  High 	Critical for a watering device since it aimed for very broad public. It should be easy to operate even by children and senior citizens. The product's function must be communicated through design.
Ease of maintenance		It is very easy to access for maintenance and it does not require any special tools. Very little maintenance required.
Quantity of user interactions		There are some important user interactions such as: setting the time and amount of water desired, adding the water.
Safety		There are some safety issues to be considered. It needs to monitor the water for overflow. It needs to use low voltage as a supply. It needs to be designed for safe and reliable operation.
<b>Aesthetics</b> Product differentiation		There were some models that seem to have similar functions on the market when the WPD was introduced. Its computer interface was essential for differentiation.
Pride of ownership, fashion, or image		The WPD was intended to be a highly enigmatic product used by people, who can surprise their guests and friends, showing that water coming from out nowhere.
Team motivation		The WPD's novel form turned out to be an important inspiration to the development team and selling point for senior management.

### Industrial Design's role in the WPD

Needs	Level of Importance	Explanation of Ratings
Quality of the User Interfaces	Low                      Medium                      High 	<p>In general, the WPD is easy to use. For example: the time for watering can be adjusted just by turning the knob, the duration of watering determines the quantity of water released into the soil, but the customer will have to deal only with the amount of water he/she requires for each plant.</p>
Emotional Appeal		<p>The WPD has a high emotional appeal which stems from its slim appearance, consuming very little space and less than average size.</p>
Ability to Maintain and Repair the Product		<p>The WPD rates high in this category. The lid is easy to open for adding water or for maintenance, if such is required.</p>
Appropriate Use of Resources		<p>The final design includes only those features that satisfy real customers needs. Materials were selected to satisfy manufacturing constrains, to withstand the continuous use, and to meet strict appearance criteria.</p>
Product differentiation		<p>The WPD's appearance is unique. It is the only watering system for home plants that can be controlled by the computer.</p>





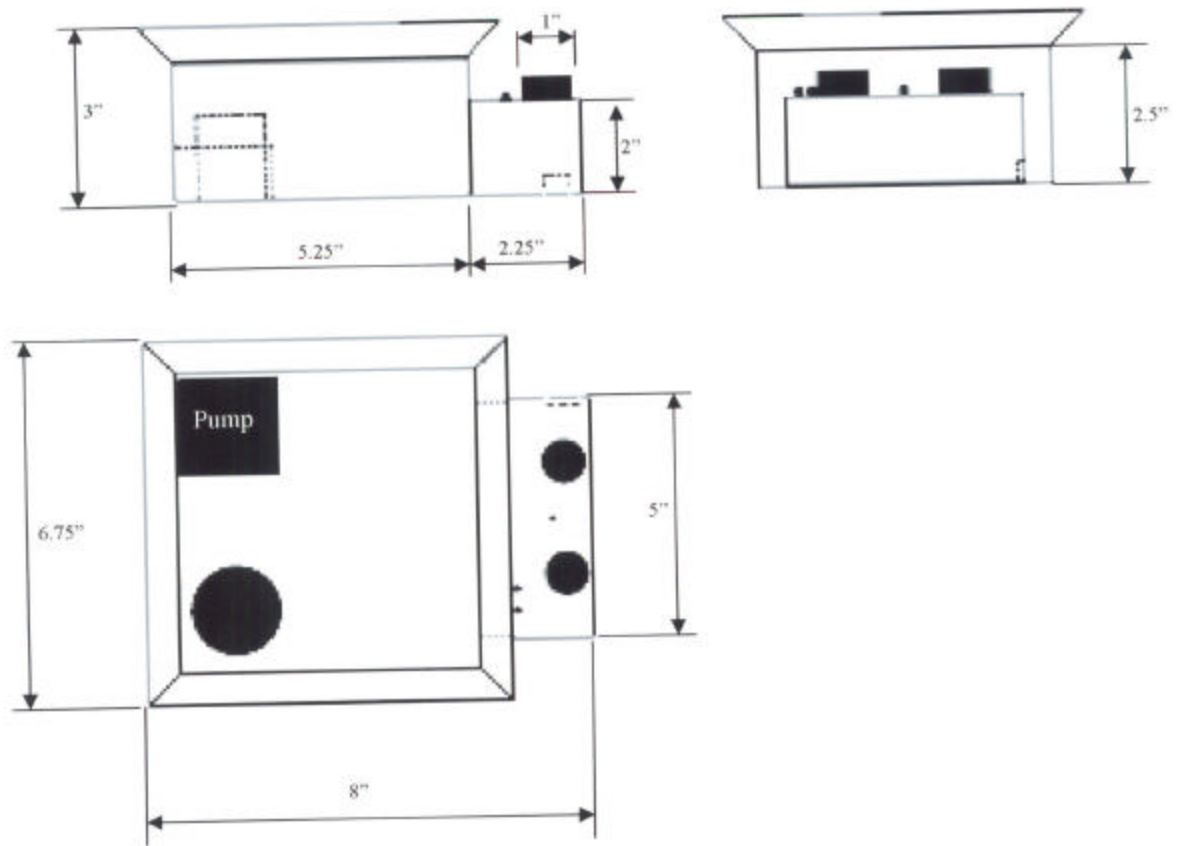


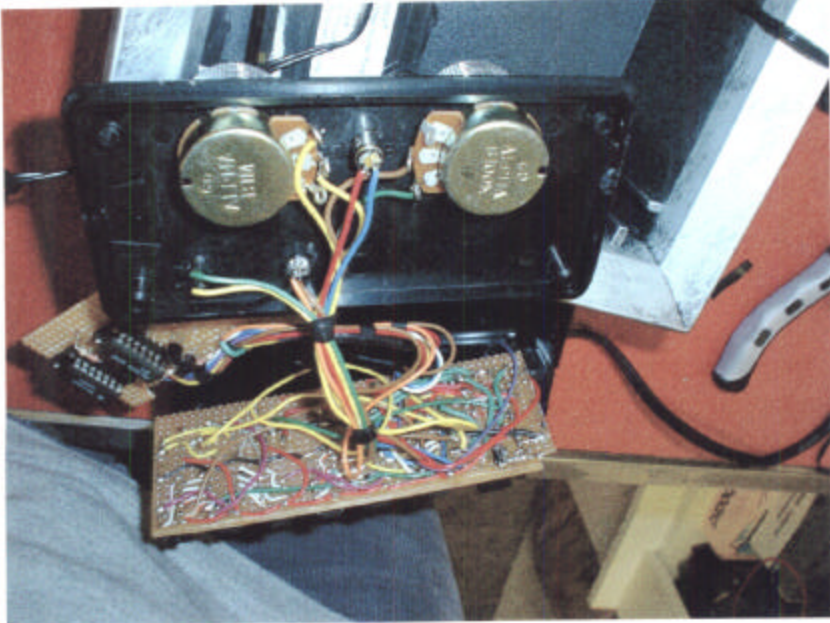
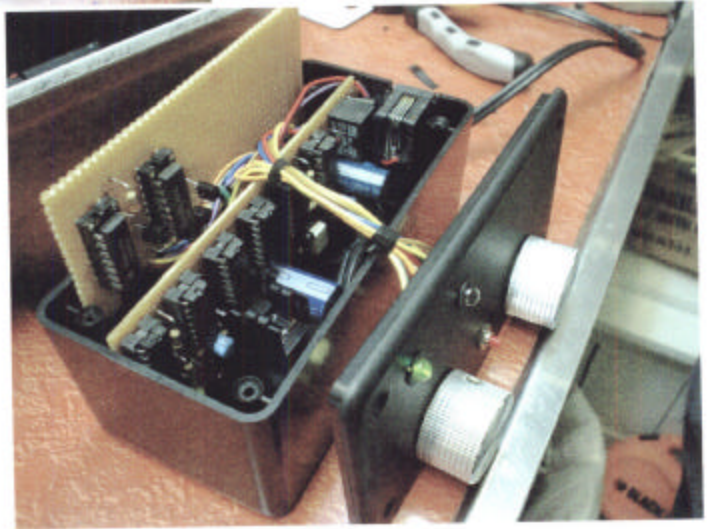
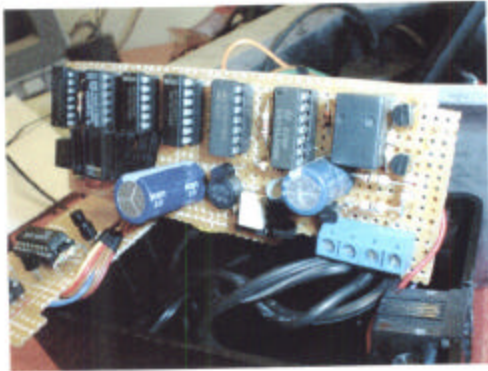
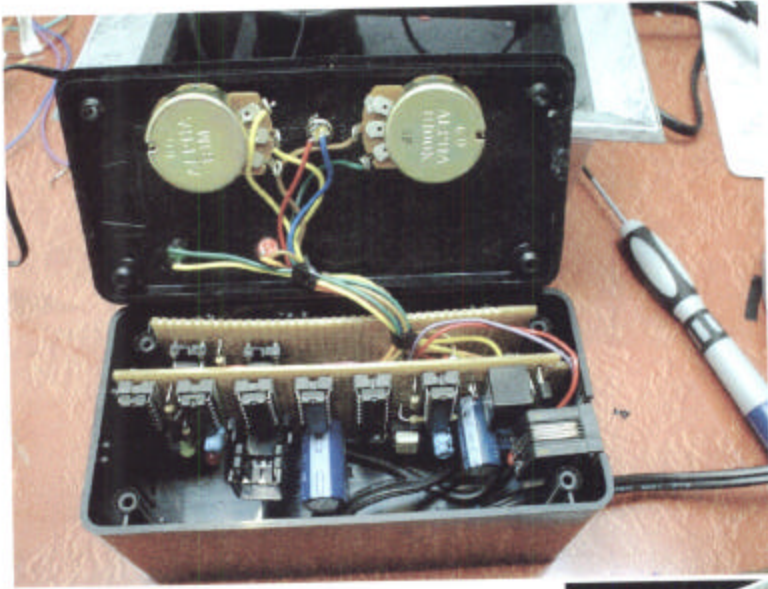
### Bill of Materials with Cost Estimate

Component	Quantity	High ( \$ each)	Low ( \$ each)	High Total ( \$ each)	Low Total ( \$ each)
Motor	1	3	2	3.00	2.00
Pump	1	3	2	3.00	2.00
Pipe	1	0.50	0.50	0.50	0.50
Container	1	2	1	2.00	1.00
Circuit box	1	1	0.50	1.00	0.50
555 Timer	1	0.59	0.59	0.59	0.59
Resistor	13	0.10	0.05	1.30	0.75
Transistor	9	0.40	0.20	3.60	1.80
Capacitor	4	0.55	0.30	2.20	1.20
Diode	5	0.20	0.10	1.00	0.50
LED	3	0.45	0.25	1.35	0.75
74393N	4	0.56	0.28	2.24	1.12
AND Gate	4	0.58	0.29	2.32	1.16
OR Gate	1	0.58	0.29	0.58	0.29
Knob	2	0.25	0.15	0.50	0.30
Assembly at \$20/hr.		30 min	20 min	10.00	6.67
Overhead at 25% of direct cost				8.80	5.30
<b>Total Cost</b>				<b>44.00</b>	<b>26.41</b>



## Final Design Drawings



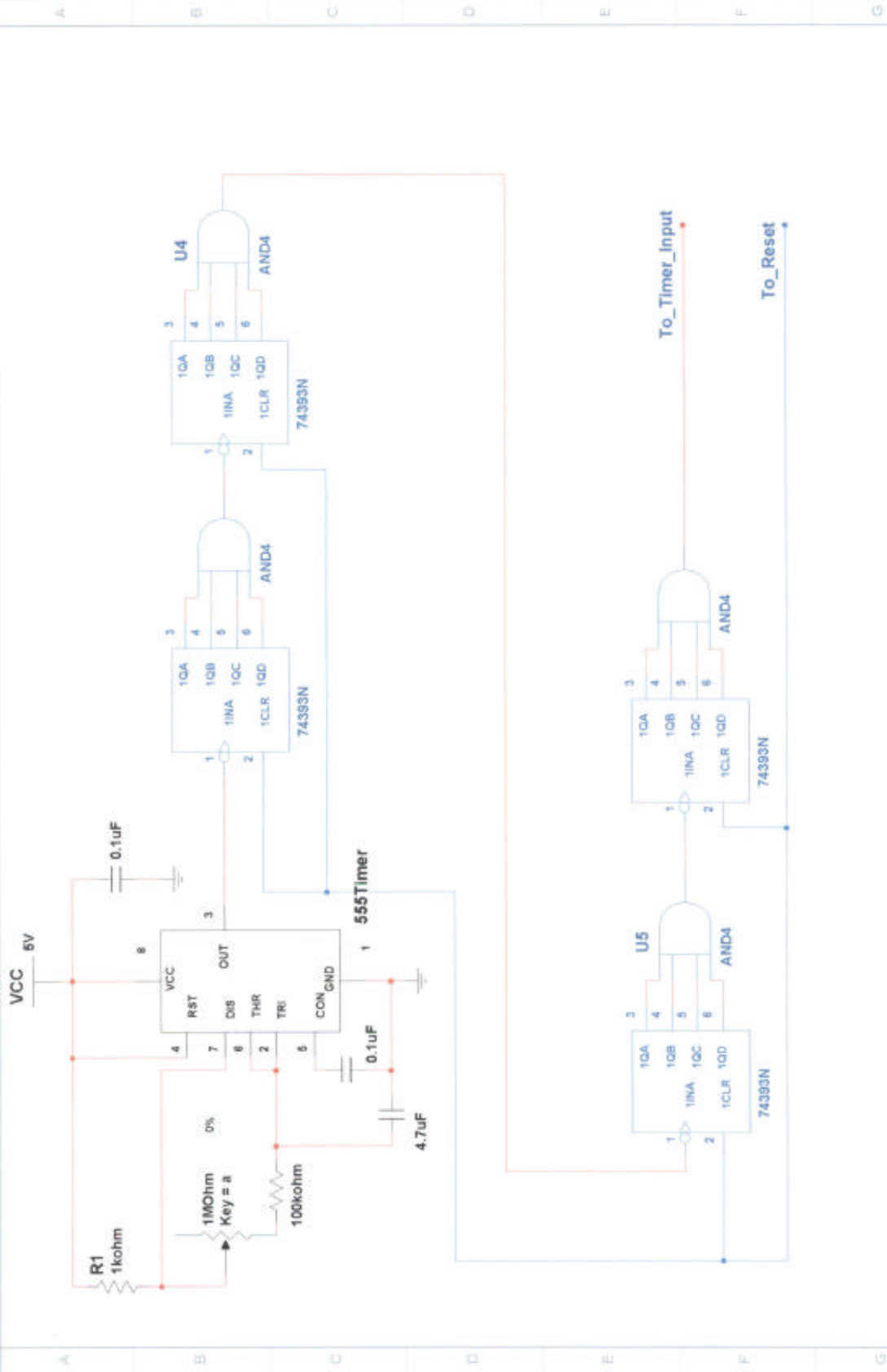




```
Automatic Plant Watering System
-----
New York City Technical College
Written By:
Jacek Taper and Sergey Stankevich

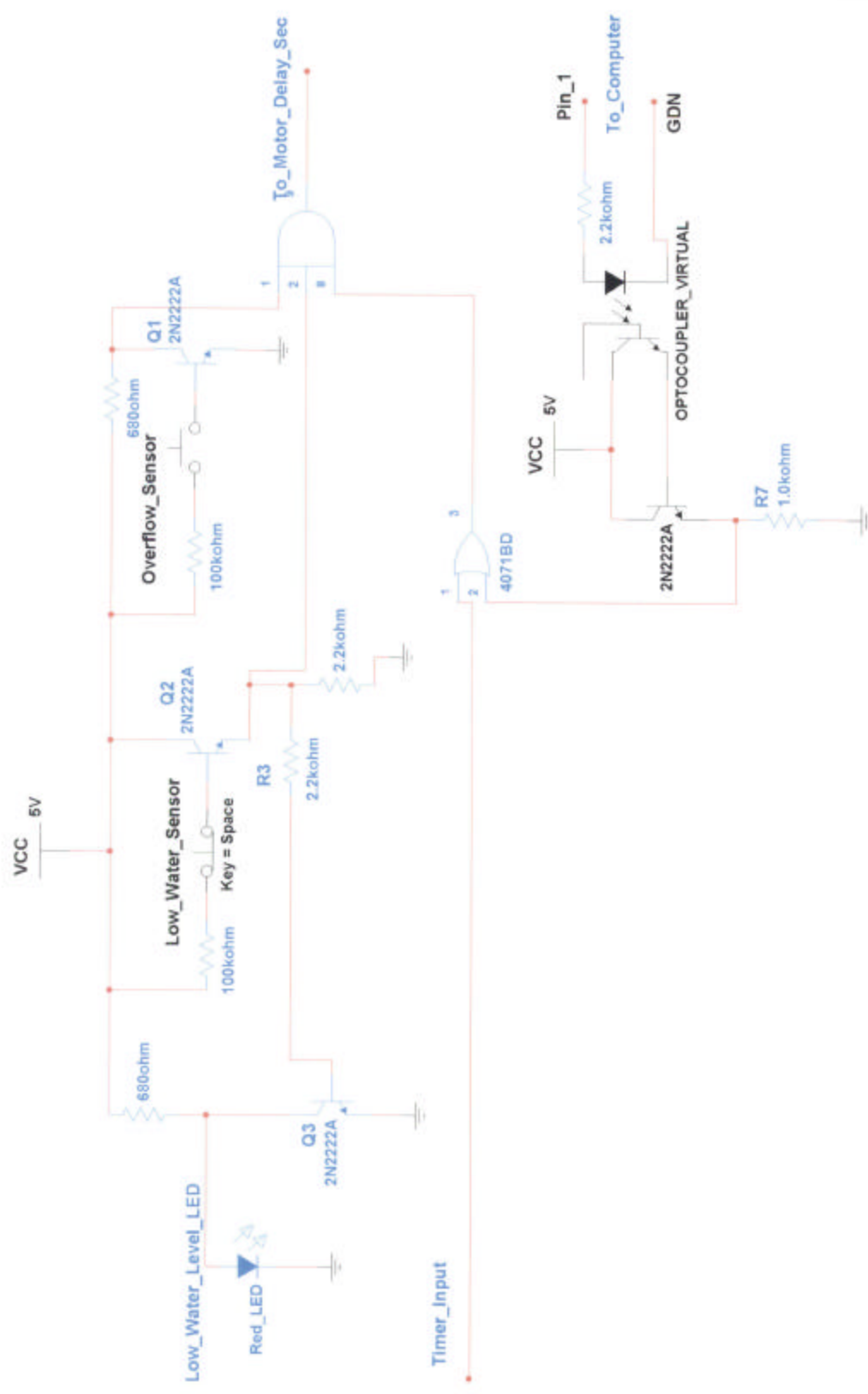
Would you like to water your plant (Y/N)?
```





Title: Timer_Logic_Section							
Project 1							
Designed by:	Jacek Taper	Document N:	0001	Revision:	1.0		
Checked by:		Date:	Mar 22, 2002	Size:	A		
Approved by:		Sheet:	1 of 1				

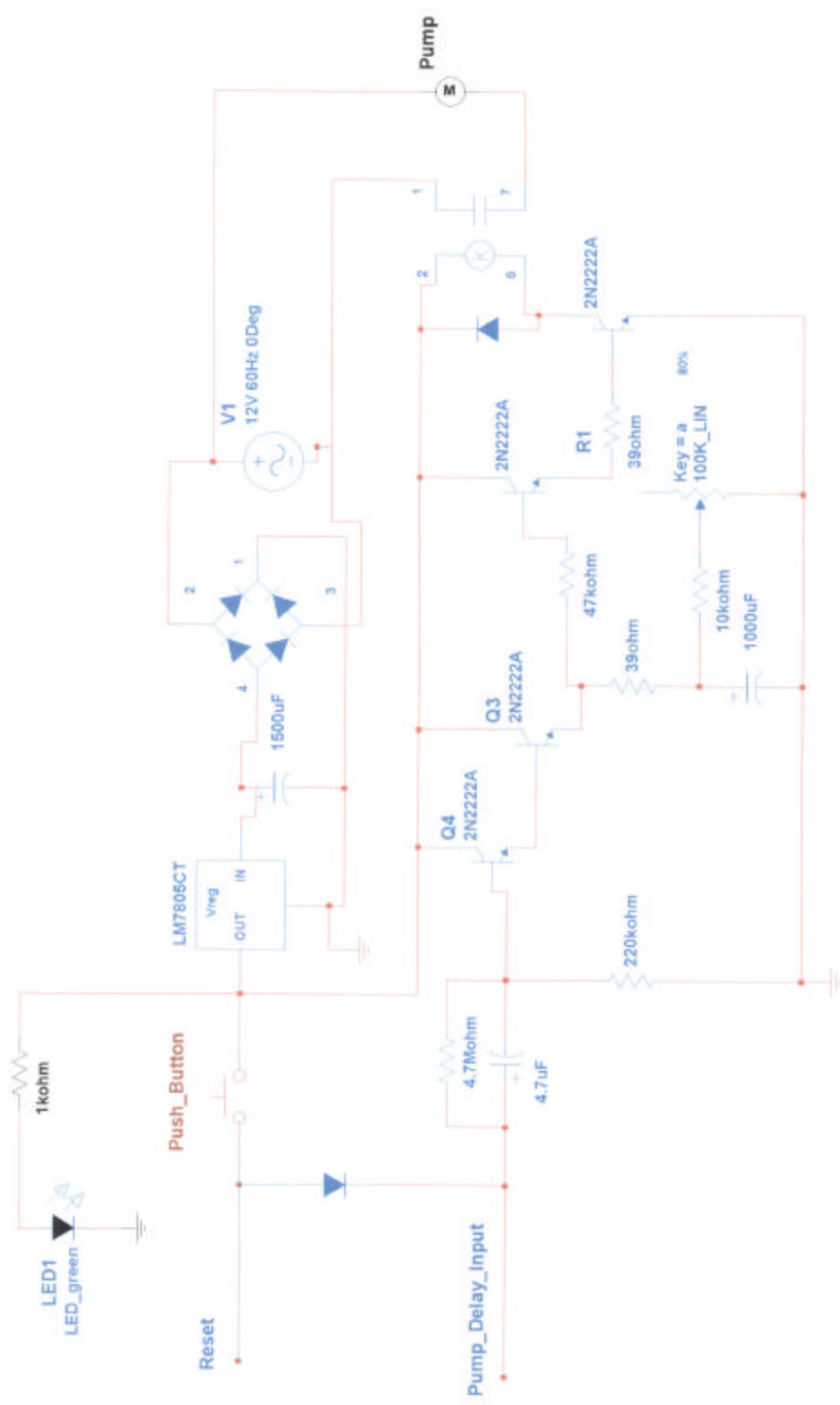




Title: Computer_and_Sensors_Section							
Project 1							
Designed by:	Jacek Taper	Document N°	0001	Revision	1.0		
Checked by:		Date	May 07, 2002	Size	A		
Approved by:		Sheet	1 of 1				







Title: Motor_Delay_Section		Document N:	0001	Revision:	1.0
Project 1		Designed by:	Jacek Taper	Date:	May 07, 2002
		Checked by:		Size:	A
		Approved by:		Sheet 1 of 1	



```
//Automatic Plant Watering System
//Written by Jacek Taper
#include<conio.h>
#include<iostream.h>
#include<dos.h>
#include<stdio.h>
#include<time.h>
#define port 0x378
void heading(void);
void wait ( int seconds )
{
    clock_t endwait;
    endwait = clock () + seconds * CLK_TCK ;
    while (clock() < endwait){}
}

long int main()
{
    int data;
    char choice,c;
    long int d=0,h=0,m=0,s,index=1;
    heading();
    do
    { long int TimeLeft=0,frequency=0,temp=0,input=0,days=0,hours=0,minutes=0,sec=0;
      data=0;
      outportb(port,data);
      heading();
      gotoxy(1,15);
      printf("Would you like to water your plant (Y/N)? ");
      cin>>choice;
      if (choice != 'y' && choice != 'Y')
      {
          heading();
          gotoxy(1,15);
          textattr(16*0+3);
          cprintf("Thank you for using Automatic Plant Watering System! \n");
          wait(2);
          break ;
      }
      gotoxy(1,15);
      printf("How often would you like to water your plant? (day/hour/min/sec)");
      cin>>d>>h>>m>>s;
      frequency=(d*86400)+(h*3600)+(m*60)+(s);
      time_t seconds;
      heading();

      do
      {long int temp_sec=1,temp_min=60,temp_hours=3600,temp_days=86400;
        sec=frequency;
        seconds = time (NULL);
        temp=seconds+frequency;
        if (kbhit())
            break ;
        while (temp>seconds)
        {
            seconds = time (NULL);
            TimeLeft=temp-seconds;
            if (kbhit())
                break ;

            if (sec>60)
            { do
              {
                  sec=sec-60;
              }
            }
        }
      }
    }
}
```

```
        minutes++;
    } while (sec>60);
}
if (minutes>60)
{
    do
    {
        minutes=minutes-60;
        hours++;
    } while (minutes>60);
}
if (hours>24)
{
    do
    {
        hours=hours-24;
        days=days+1;
    } while (hours>24);
}
if ((TimeLeft+temp_sec)==frequency)
{
    sec--;
    temp_sec=temp_sec+1;
    if (sec==0)
    {
        sec=60;
    }
}
if ((TimeLeft+temp_min)==frequency)
{
    minutes=minutes--;
    temp_min=temp_min+60;
    if (minutes==0)
    {
        minutes=60;
    }
}
if ((TimeLeft+temp_hours)==frequency)
{
    hours=hours--;
    temp_hours=temp_hours+3600;
    if (hours==0)
    {
        hours=24;
    }
}
if ((TimeLeft+temp_days)==frequency)
{
    days--;
    temp_hours=temp_hours+86400;
}
gotoxy(1,15);
printf("Time left is:  ");
printf("%d",days);
printf(" days and ");
printf("%d",hours);
printf(":");
printf("%d",minutes);
printf(".");
printf("%d",sec);
printf(" ");
printf("
        ");
    if ( TimeLeft==0)
    {
        gotoxy(1,15);
        printf("Your plant has just been watered!
        \n");
        gotoxy(1,17);
        data=1;
        outportb(port,data);
        wait(2);
        printf("It has been watered ");
        printf("%d",index);
        printf(" time(s).");
    }
}
```



```
        index++;
        wait(2);
    }
}while (1);

} while (choice =='Y' || choice=='y');
data=0;
outportb(port,data);

return 0;
}
void heading(void)
{
clrscr();
textattr(16*1+15);
gotoxy(20,2);
cprintf("Automatic Plant Watering System");

textcolor(15);
gotoxy(19,3);
cprintf("=====");

textattr(16*5+14);
gotoxy(28,7);
cprintf("Written By:");

textattr(16*4+15);
gotoxy(19,9);
cprintf(" Jacek Taper and Sergey Stankevich");

textattr(16*2+15);
gotoxy(19,5);
cprintf(" New York City Technical College ");
printf("\n");

textattr(16*0+15);
gotoxy(1,1);
}
```

