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MULTIPURPOSE 3 IN 1 AGRICULTURE AUTOMATION SYSTEM

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ABSTRACT: Agriculture is humankind's oldest and still its most important economic activity, providing the food, feed, fiber, and fuel necessary for our survival. As the global population is increasing rapidly, agricultural production must double if it is to meet the increasing demands for food and bio energy. Given limited land, water and labor resources, it is estimated that the efficiency of agricultural productivity must increase to meet that goal, while limiting the growing pressure that agriculture puts on the environment. Automation can play a significant role in society meeting agricultural production needs. For six decades robots and automation have played a fundamental role in increasing the efficiency and reducing the cost of industrial production and products. In the past twenty years, a similar trend has started to take place in agriculture,. More recently, farmers have started to experiment with autonomous systems that automate or augment operations such as pruning, thinning, and harvesting, as well as mowing, spraying, and weed removal. In the fruit tree industry, for example, workers riding robotic platforms have shown to be twice as efficient as workers using ladders. Advances in sensors and control systems allow for optimal resource and integrated pest and disease management. This is just the beginning of what will be a revolution in the way that food is grown, tended, and harvested. So by considering same approach we have developed a Multipurpose agriculture automation system which will do 3 task in one go that is we can cut the grass, spray powder and liquid insecticide at the same time using single system.

I. INTRODUCTION

In a proposed system we have designed a structure consists of three configurations that is DC motor, Vacuum Sprayer and Tank-pipe spray arrangement. In first configuration the cutter is connected to motor shaft which will be use for grass cutting. DC power supply of 12v is provided to DC motor through switch S1.In second one the vacuum sprayer will be used to spray powder on crops.AC supply of 230v is provided to Powder sprayer through switch S2. And in third configuration tank is filled with liquid insecticide. We have inserted a small pump in tank

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and the pipe has taken out from the pump to the sprayer, AC 230v supply is provided to pump through switch S3.

When Switch S1 is pressed the dc motor will start rotating and cutter will cut the grass. Also when switch S2 is pressed the powder will start spraying on crops. Similarly when switch S3 is pressed ,the pump will get started and the liquid insecticide in the tank will get sprayed on the crops. In this way we can perform three different task using single automated system. This system will be efficient and will definitely save time and labor work for agricultural use

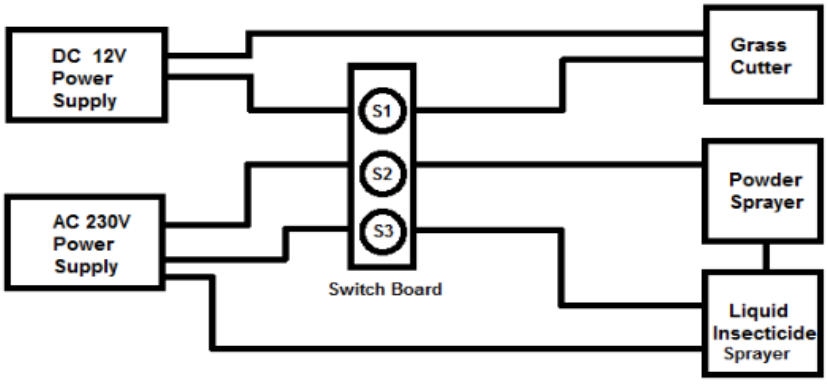
II. LITERATURE REVIEW

1. Dr. R. D. Dhete' s research paper on types of spraying mechanisms describes various types of mechanisms that are being used in the industry for spriaying of chemicals and they can be useful.

2. Different types of Spraying mechanisms were also referred from a research work published by Massey University New Zealand.

3. The methodology for calculation of design work were studied and analysed from a paper on "Mannually operated Multi-nozzle sprayer" by Rushikesh Ghadge, Savitribai Phule Pune University & Sandeep H. Poratkar, from Tulsiramji Gaikwad Patil College of Engg & Technology titled "Development of Multinozzle Pesticides Sprayer Pump"

III. BLOCK DIAGRAM OF MULTIPURPOSE AGRICULTURE AUTOMATION SYSTEM



1. Grass cutter:

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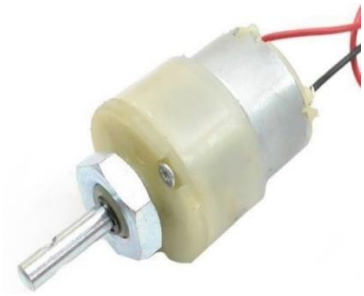
The unwanted grass in a lawn is necessary to remove. Hence conventional methods are to cut the grass manually i.e. with the help of handy cutting machine tool. But it is quite time consuming. Also man power is utilized. Hence some provision is required to minimize the efforts. Hence grass cutter machines are developed. But one operator is engaged & machine is to be pushed manually. Unwanted grass in rainy season is to be cut. This is required in order to fascinate our lawns, house, ground areas, or the grass in school/college ground, company ground or municipal corporation ground. The conventional manual method of cutting grass is very slow; also there is fear of snakes. To overcome this problem, automatic grass cutting machine is developed. This will have electric motors for its travel. The cutting blades are also operated with the help of DC motors. Provision of remote operation is also done to handle the

The provision should be made so as to operate the machine automatically. The machine should travel in forward as well as reverse direction with remote control. The operating person will be seated at one location & will operate the machine. RF transmitter & receiver are used. The operating range is 30meters & it is enough for this application.

1. Household grass cutting.
2. **Gear Motor:**



A **gear motor** is a specific type of electrical motor that is designed to produce high torque while maintaining a low horsepower, or low speed, motor output. Gear motors can be found in many different applications, and are probably used in many devices in your home.

Gear motors are commonly used in devices such as can openers, garage door openers, washing machine time control knobs and even electric alarm clocks. Common commercial applications of a gear motor include hospital beds, commercial jacks, cranes and many other applications that are too many to list.

Basic Principles of Operation

A gear motor can be either an AC (alternating current) or a DC (direct current) electric motor. Most gear motors have an output of between about 1,200 to 3,600 revolutions per minute

(RPMs). These types of motors also have two different speed specifications: normal speed and the stall-speed torque specifications.

Gear motors are primarily used to reduce speed in a series of gears, which in turn creates more torque. This is accomplished by an integrated series of gears or a gear box being attached to the main motor rotor and shaft via a second reduction shaft. The second shaft is then connected to the series of gears or gearbox to create what is known as a series of reduction gears. Generally speaking, the longer the train of reduction gears, the lower the output of the end, or final, gear will be.

An excellent example of this principle would be an electric time clock (the type that uses hour, minute and second hands). The synchronous AC motor that is used to power the time clock will usually spin the rotor at around 1500 revolutions per minute. However, a series of reduction gears is used to slow the movement of the hands on the clock.

For example, while the rotor spins at about 1500 revolutions per minute, the reduction gears allow the final secondhand gear to spin at only one revolution per minute. This is what allows the secondhand to make one complete revolution per minute on the face of the clock.

3. Gear Motors and Increased Force

Gear motors are commonly used in commercial applications where a piece of equipment needs to be able to exert a high amount of force in order to move a very heavy object. Examples of these types of equipment would include a crane or lift Jack.

If you've ever seen a crane in action, you've seen a great example of how a gear motor works. As you have probably noticed, a crane can be used to lift and move very heavy objects. The electric motor used in most cranes is a type of gear motor that uses the basic principles of speed reduction to increase torque or force.

Gear motors used in cranes are usually specialty types that use a very low rotational output speed to create incredible amounts of torque. However, the principles of the gear motor used in a crane are exactly the same as those used in the example electric time clock. The output speed of the rotor is reduced through a series of large gears until the rotating, RPM speed, of the final gear is very low. The low RPM speed helps to create a high amount of force which can be used to lift and move the heavy objects.

4. Rectifier unit

Rectifier unit is a ckt. Which converts A.C. into pulsating D.C. Generally semi-conducting diode is used as rectifying element due to its property of conducting current in one direction only Generally there are two types of rectifier.

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Half wave rectifier
Full wave rectifier.
In half wave rectifier only half cycle of mains A.C. rectified so its efficiency is very poor. So we use full wave bridge type rectifier, in which four diodes are used. In each half cycle, two diodes conduct at a time and we get maximum efficiency at o/p.

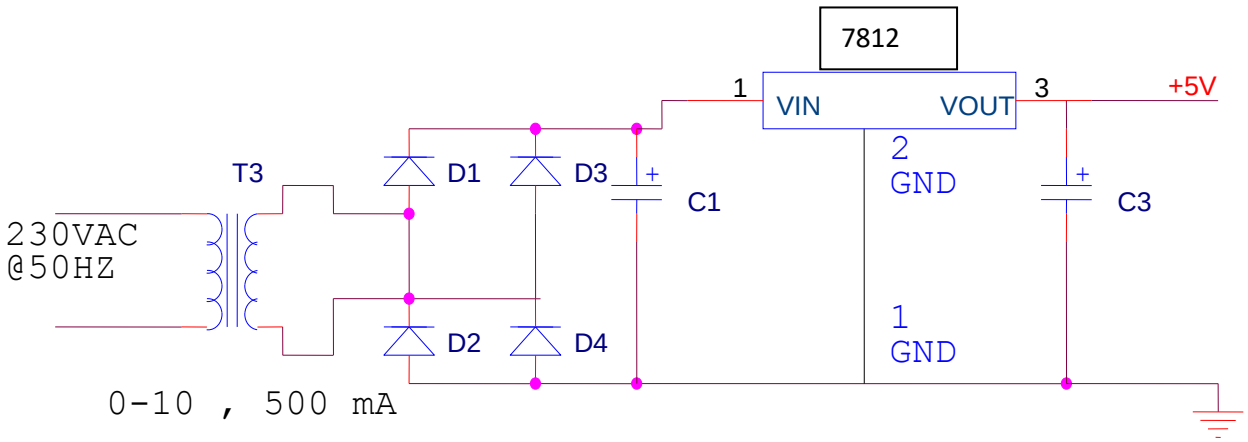
Following are the main advantages and is advantages of a full-wave bridge type rectifier ckt.

5. Filter circuit

Generally a rectifier is required to produce pure D.C. supply for using at various places in the electronic circuit, However, the o/p of rectifier has pulsating character i.e. if such a D.C. is applied to electronic circuit it will produce a hum i.e. it will contain A.C. and D.C. components. The A.C. components are undesirable and must be kept away from the load. To do so a filter circuit is used which removes (or filter out) the A.C. components reaching the load. Obviously a filter circuit is installed between rectifier and voltage regulator. In our project we use capacitor filter because of his low cost, small size and litile weight and good characteristic. Capacitors are connected in parallel to the rectifier o/p because it passes A.C. but does not pass D.C. at all.

6. Three terminal voltage regulators

A voltage regulator is a ckt. That supplies constant voltage regardless of change in load current. IC voltage regulators are versatile and relatively cheaper. The 7800 series consists of three terminal positive voltage regulators. these ICs are designed as fixed voltage regulator and with adequate heat sink, can deliver o/p current in excess of 1A. These devices do not require external component. This IC also has internal thermal overload protection and internal short circuit and current limiting protection for our project we use 7805 voltage regulator IC.



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IV. TESTING AND TROUBLESHOOTING

1. Before soldering in components:

- Check that component agree with the parts list (value and power of resistors, value and voltage rating of capacitor, etc.) if in any doubt double check the polarized components (diodes, capacitor, rectifiers etc)
- If there is a significant time elapse between circuit, take the trouble to read the article; the information is often given in a very condensed from. Try to get most important point out of the description of the operation of the circuit, even if you don't understand exactly what is supposed to happen.
- If there is any doubt that some component may not be exact equivalent, check that they are compatible.
- Only use good quality IC sockets.
- Check the continuity of the tracks on the PCB (and through plated holes with double sided boards) with a resistance meter or continuity tester.
- Make sure that all drilling, filling and other 'heavy' work is done before mounting any components.
- If possible keep any heat sinks well isolated from other components.
- Make a wiring diagram if the layout involves lots of wires spread out in all directions.
- Check that the connectors used are compatible and that they are mounted the right way round.
- Do not reuse wire unless it is of good quality. Cut off the ends and strip it a new.

2. After mounting the component:

- Inspect all soldered joints by eye or using a magnifying glass and check them with a continuity tester. Make sure there are no dry joints and no tracks are short circuited by poor soldering.
- Ensure that the positions of all the component agree with the mounting diagram
- Check that any links needed are present and that they are in the right positions to give the desired configuration.
- Check all ICs in their sockets (see that there are no pins bent under any ICs, no near ICs are interchanged etc.)
- Check all the polarized components (diodes, capacitor etc) are fitted correctly.

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- Check the wiring (watch for off cuts of components leads) at the same time ensure that there are no short-circuits between potentiometer, switches, etc. and there immediate surrounding (other components or the case). Do the same with mounting hardware such as spacers, nuts and bolts etc.
- Ensure that the supply transformer is located as closely as possible to the circuits (this could have a significant improvement in the case of critical signal level).
- Check that the connections to the earth are there and that they are of good contact.
- Make sure the circuit is working correctly before spending any time putting it into a case.

V. CONCLUSION

1. This is comparatively better solution to what is being currently used and other methods in terms of efficiency.
2. This is completely eco-friendly & a pocket friendly solution that is feasible and effective.
3. The main problem faced by the farmer is to carry the entire load of the pesticide tank on his shoulder which was causing backpain is solved by this machine.
4. The operator requires very less efforts as compared to the manual knapsack method. No specific training is required by the farmer (operator) to operate it.
5. The farmer can cover a large area without any external power driven equipment.

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