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PROCESS PRODUCTION GRASS CUTTER BASED LITHIUM BATTERY

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Abstract

This battery-based lawn mower is a simple tool to cut grass efficiently and quickly withouthaving to use gasoline and also without the need for an electric plug adapter to move the mower. The purpose of this paper is to be able to design a lawn mower, to know what components are used in the work process and also to know the working process of makinga lawn mower. The main power source of this tool is from a series of 21 18650 series batteries with a capacity of 46 A which are connected in parallel and in series and combined with the BMS 3s module for protection and control of the system. With a large enough battery capacity, this tool is able to operate for approximately 45-60 minutes of use.

Keywords **:** *Lawn Mower, 18650 Series Lithium Battery, Design, Manufacturing*

INTRODUCTION

The use of grass as a landscape plant can improve the aesthetic quality of buildings and the environment as a whole. For this purpose we need grass that meets visual qualities such as texture density, uniformity, color, growth properties and smoothness, and functional qualities such as flexibility, springiness, freshness, rooting and recovery power. These qualities can be obtained with proper grass management and maintenance such as replanting and mowing. Usually cutting grass using a sickle,

lawn mower or with a lawn mower. All of these tools are indeed used according to their respective functions, while lawn mowers, which are now often found in the community, are widely used for cutting grass which is usually in a large yard and requires speed in cutting grass. Compared to conventional lawn mowers with fuel oil, they have an efficient value in terms of use, but these machines have a fairly expensive price and still have to spend money to buy the fuel. Taking this into account the author wants to make a lawn mower using a battery as its power source because using a battery can lighten the load of the tool and does not take up space in its storage, in previous studies there was a lawn mower but using an accumulator or battery as a source of power from DC motors.

RESEARCH METHOD

For the preparation of reports and the design of this planned tool the author needs data as a reference to obtain maximum results in this writing, for that the author uses several data collection methods as follows:

1. Literature Study
   That is studying or looking for information or taking material from literature books related to planning tools from libraries, the internet, or books.
2. Observation Method
   That is collecting data by direct observation to the field related to planning and design on a axis.
3. Consultation Method
   That is, the author gets guidance from the supervisor based on the application of the theory obtained in lectures, as well as input from friends so that the author will be more perfect and directed to complete this report.

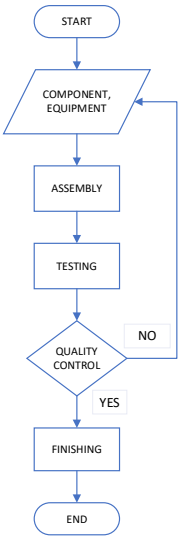

Figure 1. Research Flowchart

RESULT AND DISCUSSION

This Battery-based lawn mower is a breakthrough tool to cut grass efficiently and quickly without having to use gasoline and also without the need for an electric plug adapter to move the mower.

In this tool there are several important components, namely as follows:

1. Battery type 18650
   Is a type of battery that can be recharged (rechargeable) and used as the main power tool.
2. RS 775 DC Motor.
   Dinamo 775 is a hardware shaped like a tube with a diameter of 42mm circle and dynamo length 66.7mm. This dynamo is the main axis for driving the lawn mower, this dynamo is capable of rotating at a speed of 6000rpm.
3. Cable
   The use of the cable on the lawn mower is to deliver a current of electrical energy that is connected from the battery to the dynamo, so that the dynamo can move for the lawn mower.
4. 2 inch . PVC pipe
   This 2 inch PVC pipe functions as a place and battery storage container.
5. 1 inch PVC pipe
   This 1 inch PVC pipe will function as the main pole as well as the connection from the battery to the bottom of the lawn mower.
6. Pipe 1 inch
   This 1 inch PVC pipe serves as a place for the dc motor to move the lawn mower.
7. Connection of 1 to 2 inch PVC pipe
   This 1 TO 2 inch PVC pipe connection serves to connect the battery housing sleeve to the main stem.
8. inch . pipe T joint
   The inch T pipe joint serves as a connector between the handle and the main PVC pipe pole.
9. Connection L pipe inch
   The inch L pipe connection serves to bend the PVC pipe if needed.
10. 2 inch PVC pipe hubcap 2 inch PVC pipe hubcap Serves as a cover on the PVC pipe that contains the battery.
11. 1 inch . PVC pipe hubcap
    1 inch PVC pipe hubcap Serves as a cover for a PVC pipe containing a DC motor.
12. 2 pin switch
    Serves to disconnect or connect the current from the battery to the DC motor.
13. Trimmer Strings.
    Functions as a lawn mower blade.
14. Solder
    Solder serves as a means of connecting the cable to the battery axis and also connecting to the dynamo using lead.

15. Chainsaw
    The saw is a support tool for cutting a pipe that is too long or too large in dimensions.
16. AC DC cable.
    The AC DC cable is a supporting device that functions as a liaison for energy from the battery to the dynamo so that the dynamo can rotate.

The lawnmower workflow begins when the tool is turned on. The 18650 battery inside the 2 inch PVC pipe will supply current to the 775 DC motor through the DC DC cable stored in the 1 inch PVC pipe. Furthermore, the 775 dc motor will move the cutting blade located at the bottom, and for. disconnect or connect the electric current to the machine using a 2 pin switch located on the handle of the lawn mower. The factors that influence the success in how this tool works:

1. Battery
   The drawback is in the battery section because if the battery has an inappropriate capacity it can make the electric motor unable to work optimally.
2. Lawn Mower
   If the lawn mower uses blades made of iron, it is feared that it can make the performance of the electric motor less than optimal and become hot quickly.

In the test, the first step is to install the battery to provide power to the dynamo then by pressing the switch button aims to connect the current to the armature and make the armature move (work). Then what makes the output of the cutter string rotate to start cutting the grass which is considered long, if it is finished, press the off switch button so that the current is cut off and the dynamo rotation will stop rotating.

The process and materials used during the manufacture of lawn mowers:

1. Make a place for the battery with a 2 inch PVC pipe cut to 20 cm and a 2 inch hubcap for the pipe cover and the other end of the pipe is given a 2 x1 pipe connection to connect to the 1 inch PVC main pole.

Figure 2 PVC pipe Battery storage

2. A battery circuit consisting of 21 batteries in 3 series and 7 parallel circuits and then connected to the BMS (battery management system) module which functions as a monitor as well as protection of the battery arrangement and then the pin socket output cable is insalled.

Figure 3. Battery Pack

3. Make the handle or handle of the machine at once perforated to be a place for the on-off switch after which it is put together between the pipe containing the battery and the main pole of the machine.

Gambar 4 Handle Dari Pipa PVC

4. Next, insert the cable that is connected and assembled starting from the battery, switch then to the dc motor into a 1 inch PVC pipe which becomes the main pole of 1 m and is divided into 2 parts with sizes of 16 cm and 84 cm respectively.

Figure 5. Handle Of PVC Pipe

5. Make an electric motor holder made of PVC board with a thickness of 3 mm and cut to size 9x9 cm then bend the edges by heating it and then drill and drill holes for the moving electric motor shaft and have holes drilled on the right and left sides for nuts and bolts.

Figure 6. Plate PVC

6. Then install the inner tube valve on the electric motor shaft then insert the electric motor on the PVC pipe hubcap and make it one with the motor holder

Figure 7. Motor DC

7. Cut a 1 and a half inch pvc pipe 8 cm long and punch a hole in the side, then the electric motor is inserted into the pipe and closed with 1 stngh inch paralon hubcap.

Figure 8. PVC Pipe

8. After that, combine the T connection with the electric motor circuit then bolt on the right and left sides.

Figure 9. Motor DC

9. After the parts of the electric motor and all are combined, then connect the main pole to the electric motor and exit at the T connection hole and then connect it to the electric motor through the 1 inch PVC pipe hole that has been perforated earlier then close the circuit with PVC pipe hubcap 1 the stngh inch.

Figure 10. Assembly Motor DC

10. After all the component parts are installed and the tool is ready to use.

Figure 11. Lawn Mower

The picture below is a picture of a series of lawn mowers made using the multisim application. Inside there are three components consisting of 21 batteries then the on off switch and the last one is the dynamo775.

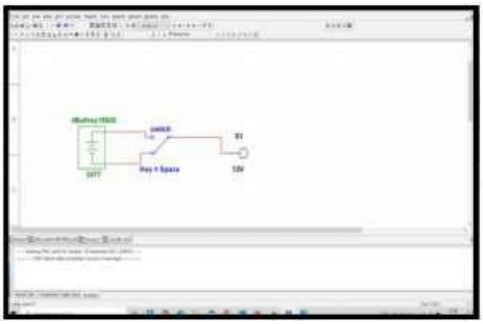

Figure 11 Lawn Mower Circuit

RESULT

In this process, it is very important to pay attention to because this process is a stage in installing components such as installing an on/off switch so that it can be connected properly. testing the lawn mower by connecting the power source to be used by the lawn mower in the form of an 18650 2200 mAh series battery so that the tool can function.

Battery Based Lawn Mower Design

In the design of this Lawn Mower the author uses solidwork software. Here is an image of the design can be seen in the image below:

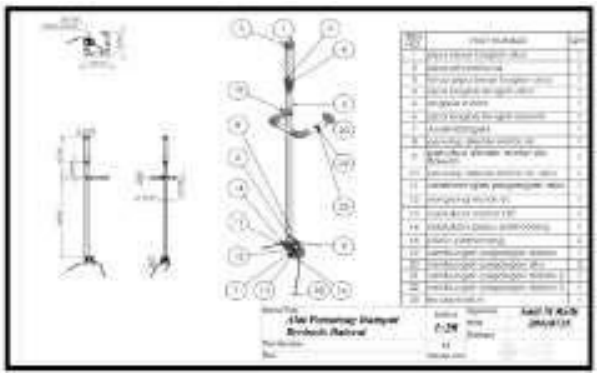

Figure 12. Prototype of Lawn Mower with PVC Pipe

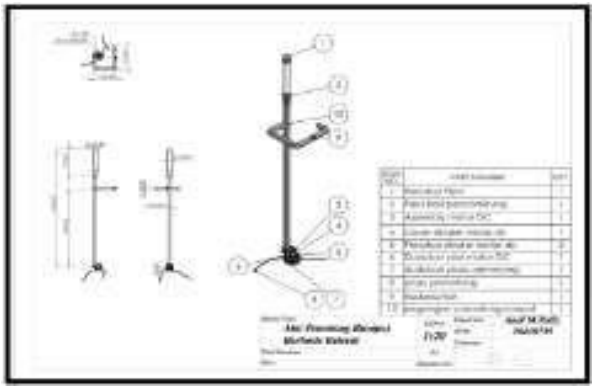

Figure 13. Manufacture of Lawn Mower With Stainless Steel Pipe

CONCLUSION

After determining the work process, assembling and making automatic fish feed tools, it can be concluded:

1. The process of making the design of this lawn mower is carried out using the Solidworks Simulations 2018 software with the dimensions of the tool, namely with a length of 144 cm and a width of 20.5 cm where the manufacturing process is in the form of making components and assembling them into a single unit.
2. The components needed in the manufacture of lawn mowers, dynamo 775 12 volt, 18650 2200 mAh battery series, DC cable, PVC pipe measuring , 1 2 , and 2 inch.
3. The first lawn mower is paired with a series of 18650 batteries with a capacity of 46A into a 2 piece of PVC pipe rod inch and then the AC/DC cable is used to supply electrical energy from the battery circuit to a 775 12 Volt dynamo, the use of the battery is to be the main power source of this tool, this lawn mower uses an on off switch, the switch is used to turn this mower on or off. This tool is also able to work without using fuel in its use because the capacity of the battery circuit is quite large and can last approximately 45-60 minutes with a cutting area of about 16.2 m2.

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