

Design and Fabrication of Arecanut Tree Climbing Machine

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Abstract:- The design and fabrication of arecanut tree climbing machine is displayed in this paper. This project comprises of a triangular base edge which underpins every one of the parts to be based upon. It is fitted with three DC motors - nylon tires with elastic grippers at 120 degrees each other for simplicity of the tasks. An exceptionally structured remote controlled machine. Power from the battery is provided to the motors utilizing adaptable wires and DPDT (Double Pole Double Throw) change is utilized to control the development of climbing machine. DC adapted motors having decrease gears which guarantees self-locking of the tires and along these lines keeps up the stature. To oblige for change in the breadth of arecanut tree as the machine climbs up and down, a spring stacked system is utilized for applying adequate strain required for grasping the tree. The project has been tried for its execution and discovered protected, dependable, and proficient and furthermore diminishes the issues in climbing and showering arecanut tree to a decent broaden.

Keywords: Tree climbing machine, Arecanut tree.

1. Introduction

Analysts all around the globe chip away at creating climbing machines, a large portion of these climbing machines are equipped for climbing ordinary structures like arecanut trees, coconut trees and so forth. Be that as it may, not many of the humans are fit for climbing trees, principle reason being unpredictable surface and variety of distance across with length [1-4]. It likewise requires more noteworthy readiness and high mobility to be utilized as an item. Additionally the bark of certain trees may not be sufficiently able to hold up under the heaviness of the climbing machine, henceforth traditional climbing machine can't be utilized for tree climbing applications [5-7]. Numerous trees like coconut tree, arecanut tree, and palm trees are tall to the point that climbing them winds up dangerous. Henceforth collecting foods grown from the ground and keeping up them winds up troublesome. So improvement of a one of a kind tree climbing system is important which might be utilized for keeping up and collecting applications.

As of late, work shortage has risen as one of the chief difficulties in cultivating. One harvest that has been most influenced by this is the arecanut. Arecanut trees achieve a height of around 60-70 feet. It is required to climb the trees at least five times each year for an effective reap.

Just gifted workers can do these cultivating activities. They need to climb the trees utilizing muscle control. As this includes genuine hard, physical effort, more youthful ages of workers are losing enthusiasm, with conceivably unforgiving ramifications for arecanut development.

The extent of this venture is constrained to climb arecanut trees having periphery somewhere in the range of 30 and 50 cm. Along these lines, keeping up adequate grating power equipped for taking care of oneself weight, keeping up the strength of the structure while in movement, decreasing the all out weight, and accomplishing the exact holding are the vital parameters that must be considered. The machine ought to be fit for changing in accordance with the shifting cross-area of the tree amid upward and descending developments. The machine should get the tree immovably to keep up its situations amid the task. The adapted motors should be sufficiently amazing to convey the payloads and weight of the machine. The strain kept up by the spring must be sufficient to keep up the holding power between the haggles. In this investigation, thinking about all the above parameters, a protected, solid and productive climbing machine.

1.1 Climbing mechanism

The arecanut tree climbing machine deals with the fundamental rule of grating that is the relative horizontal movement of two strong surfaces in contact. The machine created comprises of a base casing with 3 nylon wheels driven by 3 high torque outfitted motors. The machine is having a triangular shape, pivots are given on every connect to the development of connections with the variety in size of the tree. A spring is utilized to give adequate grasp to the wheel on the tree as indicated by the adjustment in the span of the tree. Pulley and a brake link is utilized to guarantee smooth development of the connections. The edge of the arecanut tree climber can be opened up and held over the tree. The setup is associated over the tree with the assistance of a brake link. In this tree climbing machine control is acquired from 12V battery through which drive motors are empowered. The remote is utilized to control the machine. At the point when the drive motor is exchanged on, the motor pivots the pole which thusly turns the wheels. Because of the rubbing between drive haggles bark of the tree machine ascends along the length of the tree. The contact grating between the haggles is kept up with the assistance of pressure springs and grippers on the wheels. The main segment which is in contact with the tree is the wheels which are comprised of nylon. Consequently it doesn't make any

harm the bark of the tree. At the point when the setup comes to over the tree the drive motor is turned OFF in the remote control unit. The pressure of the spring holds the machine at the required tallness. After it achieved the tallness of the tree, the entire setup is being brought back by changing the extremity of the switch so the drive engine turns inverse way there by influencing the wheels to pivot inverse way. In the wake of achieving the ground the setup is expelled from the tree and connected to the following tree for climbing.

3. Calculations

3.1. Calculation of force

Assuming weight of the machine , $W = 10 \text{ kg}$

$$W = 10 \times 9.81$$

$$W = 98.1 \text{ N}$$

Assuming coefficient of friction between tree and wheels, $\mu = 0.3$

Actual Force to be lifted, $F = W/\mu$

$$F = 98.1/0.3$$

$$F = 327 \text{ N.}$$

3.2. Selection of the Wheel

Normal Change in perimeter of the tree is taken as 35cm to 50cm. It was seen that the most extreme boundary of an arecanut tree is 50 cm and least perimeter at the best is 35 cm. 11 cm wheel is utilized in this machine for the torque confinement of the motor.

3.3. Calculation for Length of Link

Length of each link is taken as 60cm, the calculations are shows below and line diagram to calculate length of the links is shown in figure 1.

From figure 1;

$$\tan 60^\circ = BC/AB$$

$$\tan 60^\circ \times 18 = BC$$

$$BC = 31.176 \text{ cm}$$

So total length of the link,

$$DC = BC \times 2$$

$$DC = 62.32 \text{ cm} \times 60 \text{ cm}$$

$$DC = 3741.222 \text{ cm}$$



Fig:1 Arecanut tree climbing machine.

3.4. Calculation for torque

Calculating motor torque,

$$\text{Torque} = \text{Mass} \times \text{gravity} \times \text{radius}$$

$$\text{Torque} = 9 \times 9.81 \times 0.07$$

$$= 6.180 \text{ Nm}$$

$$= (6.180 \times 100) / 100$$

$$= 61.80 \text{ kg cm}$$

4. Specifications and Functions of Parts

4.1. Motors

Three motors are utilized in this machine, in which all motors are utilized to drive the wheels of the machine. The DC motors used to drive wheel is square adapted DC motors. It is the core of the setup. It is the principle source through which torque is produced. It give the extremely basic torque to the setup to move up and descend along the length of the tree. Specifications are given below;

Volt: 12 V

Speed: 100 rpm

Torque: 61.80 kg-cm.

4.3. Wheels

In this machine three driving wheels are utilized. Driving wheels are machined from nylon poles having distance

across of 110 mm which is utilized to give firm hold and furthermore to work the machine so it climbs the tree effectively.

4.4. Remote Control Unit

The remote comprises of one Double Pole Double Throw (DPDT) and five press switches in which one press switch is sham. The switch board is utilized to control the DC outfitted motors.

5. Conclusion

In the wake of testing the machine on the arecanut tree, it has been discovered that the plan is productive in climbing the tree all around easily without harming the tree. The climbing instrument was working as indicated by the necessity. The structure is basic and speaking to the dominant part. An incompetent work can likewise work the machine securely and proficiently.

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