WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Design and Fabrication of Electric Bike with Moving Treadmill

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ABSTRACT -

This project is about converting a regular e-bike into a treadmill electric bike. The frame of this e-bike has been totally redesigned, and a treadmill has been installed between the two wheels on which the user will walk. We used a speed controller to alter the speed of the treadmill so that a person may walk or run at their desired speed.

The motion of the motor is passed to the front wheel, which causes the wheel to spin and the e-bike to run. In this project, we have two motor arrangements: one for the running bike and another for the running treadmill. The power for the motors is given by batteries. The goal of the project is to design and manufacture an electric bike with a moving treadmill that can be used whenever and wherever a treadmill is needed.

Keywords:-Treadmill, e-bike,Speed controller,batteries and motor.

INTRODUCTION

1.1 History of Electric Vehicle:-

It's difficult to attribute the creation of the electric car to a single person or country. Instead, the first electric vehicle on the road was the result of a sequence of innovations in the 1800s, from the battery to the electric motor. Innovators in Hungary, the Netherlands, and the United States, including a blacksmith from Vermont, began playing with the idea of a battery-powered vehicle in the early twentieth century, creating some of the earliest small-scale electric cars. Thomas Davenport created a small-scale electric automobile in 1835. Davenport was also the creator of the first DC electric motor made in the United States. While a British inventor named Robert Anderson created the first primitive electric carriage around the same time, it wasn't until the second half of the nineteenth century that French and English inventors made the first viable electric cars. Professor Stratingh of Groningen, Holland, devised and manufactured another small-scale electric automobile in 1835 with the help of his assistant Christopher Becker. William Morrison, a scientist from Des Moines, Iowa, invented the first practical electric automobile in the United States in 1890. His six-passenger vehicle, which could reach speeds of 14 mph, was essentially an electrified wagon, but it sparked interest in electric vehicles.

Need to add moving treadmill with E- bike:-

Treadmills are stationary pieces of equipment that, when connected with an e-bike, may be used wherever we want. Because treadmill activities are effective at raising heart rates to a healthy level, they are also highly useful as a warm-up activity. Elevating our heart rate to a healthy level will also allow us to safely execute additional exercises. Treadmill and Treadmill Bike Importance:

1. The treadmill is a simple piece of fitness equipment to operate.

2. The treadmill offers a consistent surface that is considerably easier to navigate than sidewalks, curbs, or trails, reducing the chance of tripping.

3. The user has complete control over the workout, including speed, incline, warm-up, cool-down, and energy expenditure.

4. In general, customers can create customized workouts to meet their schedules.

5. Multiple people can utilize the same piece of equipment without having to change the framework.

6. Some treadmills offer extra capabilities like step counters and heart rate monitors that allow you to track your fitness progress.

7. Treadmill running burns more calories than most other types of in-home exercise, such as bicycle. Regular exercise has numerous health benefits, including increased cardiac strength, weight loss, and decreased insulin resistance. Walking or running on a treadmill is a terrific way to get some exercise while putting less strain on your body than walking or running on a flat outdoor surface.

8. Patients who are in poor health or have cardiac problems might use treadmills to carefully monitor their heart rate and blood pressure. This information aids the patient in determining how much activity they can tolerate and when to quit. Here is some information on the health benefits of treadmill exercise. The treadmill bicycle is an entirely new mode of transportation. Walking with the electric help requires less work than "a

stroll across the park." The DC motor, Hall Effect Sensor, and amplifier work together to raise your walking speed to a greater level. Fuel use has increased, resulting in increased pollution and deterioration of natural resources. With the growing population and their needs, it has become imperative to regulate fuel usage and reduce pollution in order to ensure that it is available to our future generations. People are unable to pay attention to their health and physical fitness due to their hectic schedules. It can be used as a treadmill and a bicycle because it does not require any fuel. You don't have to use it as a traditional treadmill in a closed area; you may also roam the streets.

HARDWAREREQUIREMENTS

2.1 Ball Bearing

Ball bearings are a form of rolling-element bearing that uses balls to keep the bearing races separated. A ball bearing's job is to reduce rotational friction while also supporting radial and axial stresses. It accomplishes this by containing the balls and transmitting the loads through the balls via at least two races. One race is usually stationary, while the other is coupled to the rotating assembly in most applications (e.g., a hub or shaft). When one of the bearing races rotates, the balls rotate with it. The balls have a far lower coefficient of friction than two flat surfaces sliding against one other because they are rolling. Due to the smaller contact surface between the balls and races, ball bearings have a lower load capacity for their size than other types of rolling-element bearings. They can, however, put up with some misalignment of the inner and outer races.

2.2 E-bike Motor (MY1016Z3)

The E-bike MY1016Z3 24V 350W Gear DC Motor is a popular reduction dc motor and the most often used motor for scooters, bikes, and quads on the market! It's also used in numerous DIY projects, such as Segways and e-cars, as well as many robots, such as ATV robots and battle robots.

We appreciate the creative mind and the joy of making something unique. That is why we are pleased to introduce the E-bike MY1016Z3 24V 350W Gear DC Motor – 324 RPM, which comes with a 9-tooth 1/2″ (12.7mm) pitch sprocket.

This motor is ideal for people who wish to design their own personalized electric vehicle, whether it's a scooter, an electric bike, or something completely new. This electric motor features gear reduction, resulting in more low-end torque than a normal motor. By simply reversing wires, you can alter the direction of the motor to left or right.

Specifications:

1. Voltage: 24 volts DC
2. Power: 350 watt
3. Speed (after Reduction): 324 RPM
4. Torque: 11 N-.m (110 kg.cm)
5. Stall Torque: 55 N-M (550 kg.cm)
6. Weight: 2.98 Kg.
7. Current: 19.2 amp

2.3Treadmill Motor (MY1016)

E-bike 250W 24V 2650RPM DC motor MY1016 A 25-tooth chain sprocket and a 4-bolt mounting bracket (threaded M6) are included on the base. Because this is a DC motor, it can rotate clockwise or counterclockwise by just reversing the battery polarity to the motor, and it can be controlled in speed. Please see our available speed controllers if you wish to control the speed of these.

Specifications:

1. Output Power: 250W.
2. Supply Voltage: 24V DC.
3. Rated speed: 2650RPM.
4. No load speed: 3000RPM.
5. Full load Current: ≤13.7A.
6. No load Current: ≤2.2A.

2.4 Treadmill Belt

The belt, often known as "the track," is the part of the treadmill where the user's feet come into close touch. The belt is spun across the front and rear rollers as it glides across the top edge of the deck. The type of belt and materials utilized can have a big impact on the treadmill's overall cost of ownership, not just when you're using it.

2.5Freewheel

Pedal-assist sensors and a throttle are commonly found on e-bikes. Some electric bikes have only a power-on-demand electric motor. The electric motor is engaged and operated manually in this situation, using a throttle that is often located on the handgrip, similar to those seen on a motorcycle or scooter. The E-Freewheel bike's allows you to pedal backwards or keep your bike pedals still while cycling. Freewheels are simple to install on your back wheel, but make sure your electric bike's rear wheel is appropriate. This 16-tooth freewheel is ideal for Fixed Gear Bikes, Bike Try All, and other similar bikes.

2.6 Battery

Valve Regulated Lead Acid (VRLA) batteries are also known as SMF (Sealed Maintenance Free) 12V 7.5AH batteries. Because they are totally sealed, there is no possibility of acid spillage during shipping. These are utilized in high-end standby power applications such as TOYS, UPS, Electric Converters, Railway Communications, and security systems, among others. The PAOYS SMF (Sealed Maintenance Free) 12V 7.5AH batteries, also known as the Valve Regulated Lead Acid (VRLA) batteries, have a sealed maintenance free design. These flat plate batteries do not need to be recharged and do not generate any fumes or gases on a regular basis. Because they are totally sealed, there is no possibility of acid spillage during shipping. These can be mounted in any position and do not require continual maintenance due to their structure. These are utilized in high-end standby power applications such as ride-on toys, UPS, electric converters, railway communications, and security systems, among others. Sales figures for PATOYS Due to its durable construction and superior quality, Power batteries have always stood the test of time, year after year. These are made in-house with cutting-edge technology and are renowned for their overall engineering quality. It is a product that is not only long lasting and durable, but also reliable and sustainable. Each battery is built to the highest industry standards and technological requirements. This product is ideal for riding in jeeps, vehicles, and motorcycles.

Specifications

1. Type of battery Lead acid
2. Voltage 12 V
3. Current 16 A
4. Power 192 W

2.7Speed Controller

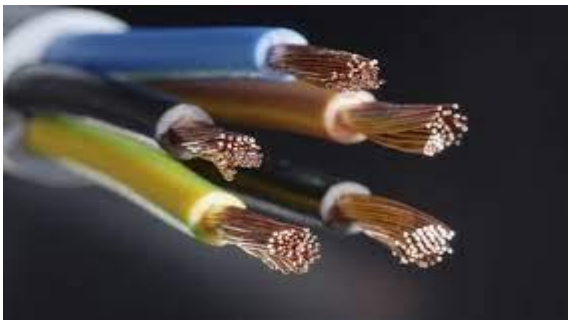
The DC Motor Speed Controller allows controlling direction of a DC motor using a Pulse-Width-Modulated (PWM) DC voltage with a Duty Cycle fully adjustable from 10%-100%. The motor speed controller can provide a continuous current of 8A to your DC motor or other DC load. The circuit also includes a 10A fuse, with the reverse connection of power supply and control voltage over-voltage protection function.

Specifications

1.	Input supply voltage	DC 12V-40V
2.	The maximum output power	400W
3.	Themaximum continuous output current	8A
4.	Static Current	0.02A(Standby)
5.	PWM frequency	13kHz
6.	Material	Plastic, metal
7.	Duty Cycle adjustable	10%-100%
8.	The operation environment temperature:	-20-40
9.	Dimension(cm)	6*5.5*2.8
10.	Net weight	69g

2.8Wires and Cables

The basic key difference between wires and cables is that a wire is a single conductor whereas a cable is a group of conductors. Although, these conductors are made of a common material- copper or aluminium. Usually, the wires are bare and are twisted. But, some of the wires are coated with thin PVC layer.



2.9 Motor Controller

This Motor Controller 24V for MY1016 350W includes attachments for the motor, accelerator, brake, battery, battery charging, brake light, power lock. DC Motors are popularly known as scooter motors or general application motors. It is extremely durable and reliable. It’s commonly found in 24V scooters or even small kiddies carts and it’s also been a proven motor in robotics.

Specifications:

1. Rated voltage: 24 V DC
2. Current limit: 33A
3. Rated power: 350 W
4. Matching motor: DC brushed motor
5. Under Voltage Protection: 20V

2.10Accelerator

E-bikes generally combine both pedal-assist sensors as well as a throttle. Some electric bikes have an electric motor that operates on a power-on-demand basis only. In this case, the electric motor is engaged and operated manually using a throttle, which is usually on the handgrip just like the ones on a motorbike or scooter.This throttle comes with a horn. This horn is very useful so as to warn others of the vehicle's approach or presence, or to call attention to some hazard. Simply connect the wire and your E-bike is ready to throttle up. It is best suitable for a 22mm electric bike for a handlebar. It has a smooth start acceleration and uniform stability. This Part is suitable and works together with all kinds of motors.

Specification:

1. High-quality product
2. Best Suitable for handle 22mm diameter Electric Bicycle
3. Comes with a Horn function
4. Has a wide variety of applications

2.11 12V Battery Charger

The DD30CRTA is a PWM switch-mode battery charger controller for a 12V lead-acid battery in a small package using a few external components. The DD30CRTA is specially designed for charging 12V lead-acid battery with trickle charge, constant current charge, over-charge and float charge mode. In over-charge and float charge mode, the regulation voltage is internally set.

2.12 Bike

Any complete round or series of occurrences that repeats or is repeated. A round of years or a recurring period of time, especially one in which certain events or phenomena repeat themselves in the same order and at the same intervals. Any long period of year age.

3.WORKING

A treadmill e-bike combines the benefits of both a treadmill and an e-bike. The motor controller is the most important component. The motor controller connects all of the input and output devices together. When the key is entered into the key socket to switch on the system, it activates all of the components. As we press the accelerator pedal harder, the motor controller sends instructions to the e-bike motor. The motor speed progressively increases as the throttle setting is increased, and the e-bike begins to run as the motor turns.

The throttle causes the e-bike to accelerate and decelerate. The breaking mechanism should be powerful to prevent accidents. As a result, in this project, we used a breaking mechanism that not only controls the wheel but also the e-bike motor via a motor controller. So, when we use the brakes, the brake shoe and the running steel ring in the wheel come into contact, and the speed is lowered owing to friction, and the e-bike eventually comes to a halt. On the other side, we can see that the brake also serves as a switch, so when we apply the brakes, the switch activates and sends a signal to the motor controller, which subsequently switches the motor off when the wheel comes to a stop. As a result, the breaking mechanism operates in this manner.

Let's look at how the treadmill works. The treadmill is made up of rollers that are built out of PVC pipe and ball bearings, and there is a treadmill belt covering the rollers. The treadmill motor is linked to one of the ends. The treadmill motor is fueled by a lead acid battery and is regulated by the speed controller. When the switch is pressed, the treadmill motor is activated, and as the speed of the treadmill is increased via the speed controller, the treadmill speed increases as well. The speed controller can handle power of up to 300W at 10A. The treadmill mechanism functions in this manner. And the entire treadmill e-bike technology functions.

4.CONCLUSION

As the price of crude oil rises, it is becoming increasingly important to use electric system cars. A treadmill e-bike can be used anywhere because it is not stationary like traditional treadmills and can also be used as an e-bike. The treadmill e-bike is environmentally beneficial because it does not utilize any organic fuels. The treadmill e-bike produces no pollution. The treadmill e-bike has a motor..

5.FUTURE SCOPE

Lead acid batteries can be converted to lithium ion batteries, which have been shown to have a better energy density than lead acid batteries. This means that a lithium ion battery can store more energy in the same physical space.The modification of an existing project is a solar powered treadmill bike. Various sensors can be utilized to modify the existing project.

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