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Fabrication of Reverse E-Trike

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ABSTRACT: Through this project we presents a singular experiment supported a really small and emerging sector of automotive industry, i.e. Reverse E-Trike. A reverse e-trike is essentially a vehicle having two wheels within the front and one on rear side. The incidence of accidental deaths has shown a rise 51.8 % within the year 2002 as compared to 2012. As we all know that safety of the vehicle is that the first and therefore the fore most thing to be considered. The utilization of a tilting mechanism in three wheel vehicles will reduce the speed of accidents caused thanks to slippage and rollover. The tilting mechanism provides directional also as dynamic stability and also increases the ride comfort and braking performance. By this tilting, the centre of gravity balances the force which is working on the vehicle and makes it more stable during turning. In our project work we've created a tilting three wheel vehicle by adding a tilting mechanism during a normal motorcycle. We have designed the tilting mechanism employing a solid works software, we've tried to stay the planning simple. The tilting mechanism are often easily joined to the most frame of the motorcycle. We've used a double wishbone type suspension in our project which helps in making the planning simple and also it increases the traction, braking performance, passenger comfort and their safety. The conceptual design of the project model is predicated on the study of several literatures associated with reverse trike

KEYWORDS: Accidents, Directional Stability, Reverse E-Trike,Tilting Mechanism

I. INTRODUCTION

Trike may be a three wheel vehicle having one wheel ahead and two wheels at rear or two wheels ahead and one wheel at rear. The trike with one wheel ahead and two wheels in rear is named Delta trike, where the trike with two wheels ahead and one wheel at rear is named tadpole Trike.

Tadpole designs are far more stable than the delta setup because the rear wheel drives the vehicle while the 2 wheels up front are liable for steering. There's also an aerodynamic benefit, since the vehicle is formed almost sort of a teardrop, wide and gather front and truly fizzling out within the rear. This enables air to flow easily over the vehicle body. Within the case of a tilting trike may be a three wheel vehicle which is in a position to tilt like inline two wheel vehicles like motorcycles and mopeds. The tilting provides greater stability during cornering and line condition. The development of the tilting mechanism is sort of a double wishbone suspension which makes construction simple and also it makes the ride easier and increases the braking performance.

Motorized tricycles are three-wheeled vehicles supported an equivalent technology as bicycles or motorcycles, and powered by electric motors, motorcycle, scooter or car engines. Counting on the planning of the vehicle, motorized trikes could also be categorized as motorcycles, motor scooters, or just the three-wheeled counterpart to a motorized or electric bicycle. The most difference between a motorbike trike and a scooter trike is that motorcycles are sat on during a "saddle"-style seating (as with a horse), with the legs apart, and motorcycles have manual transmissions. Scooters have a "step-through" seating style, during which the driving force sits on a more chair-like seat, with the legs together; also, scooters have automatic transmissions. While laypersons often associate the engine size as a line between motorcycles and scooters

The main reason to style the electrical Trike is to beat the matter with the pollution and with the economy. Future E Trike is that the best technical application as an answer for the higher world and upcoming generation. The E trike may be a battery operated vehicle that's very economical with low maintenance cost and fewer pollution. E trikes are a beautiful alternative to both

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conventional bicycles and traditional automobiles, providing an environmentally friendly, fun, efficient and convenient thanks to travel. E-trikes are driven with the assistance of battery which is including motor.

II. METHODOLOGY

• We Designed the Chassis by using Solid works.
• Analysis is by using Ansys.
• We choose a second hand bike for the essential frame of our trike.
• We disassembled the bike and cleaned the chassis.
• Dismantled the engine and separated the gearbox from it.
• We redesigned the bike chassis to suit our needs.
• Bought the extra part we'd like for the fabrication.
• Built the double-wishbone arms.
• Welded the redesigned frames.
• Added a steering system for the trike.
• Bought the motor and battery.
• Runs on a BLDC motor powered by abattery.
• Connected the BLDC motor to the crank via chain drive.
• Reassembled all the parts and electrical connections.

III. DESIGN

3.1 CHASSIS

First, we drew the chassis of the bike we need using solid works and we redesigned the chassis to suit the project by adding a small portion in front of the original chassis as shown above the figure shown above is solid work design chassis we intent to use for the construction. The gearbox is also attached to the frame. Since the engine mount needs to weld the additional portion added to the frame is to accommodate the double-wishbone system and the extra coil suspensions needed for the tilting action of the trike we used to wish for individual movement of the wheels. There 2 bar across the newly welded piece the first is for structural stability the second one is added to accommodate the swing of the wheel it is to connect the suspension of each side to one another

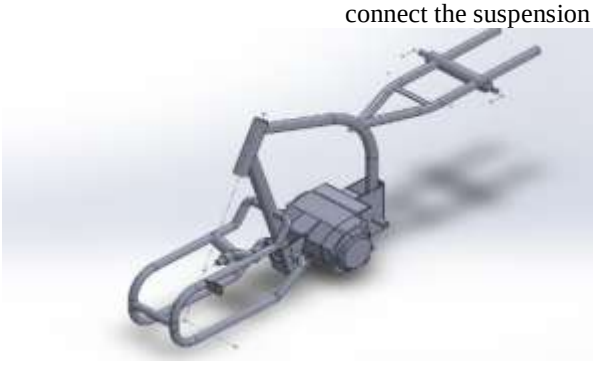

Figure 1- Chassis

3.2 WISHBONE ASSEMBLY

The wishbone system on each side of the trike consists of both the upper and lower arms of the wishbone the wheel hub is also shown in the above figure the connection extended is to connect to the steering system. The coil suspension is connected to the lower wishbone the above part will connect to the frame via bolts

Figure 2 – Wishbone assembly

3.3 FULL BODY ASSEMBLY

The shown figure is the assembled design consists of the double-wishbone the steering system the wheel and its hub. The additional part is made from hollow pipes the gearbox is also mounted on the chassis there are a total of 5 suspensions included in the system. The motor and battery and its connections are not shown in the above design. The brake clutches also not shown above design

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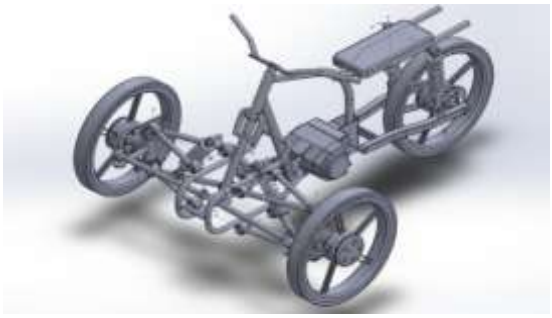

Figure 3 –Trike assembly

IV. COMPONENTS

4.1 CHASSIS

The shown chassis is the one we acquired to make the frame of our trike it is made from structural steel and is company-made and has good structural stability. The additional part was made from galvanized iron hollow pipes of 1.25 inch we choose the GI pipes instead of mi pipes since it has more strength and is less corrosive compared to the mild steel pipe and other material. Also, we choose GI pipes due its weld ability and availability and weight to strength ratio of the GI pipe the issues face with GI pipes are that they have good strength but have very low ductility so the cant is bent like on our proposed design due to this we had to make a sharp corner and causes stress concentration there. Moreover, the availability of GI pipe in different thicknesses also was a considerable factor.

Figure 4- Chassis

4.2 WISHBONE CONTROL ARM

The wishbone was made from a GI pipe of 1 inch and a steel rod of 5 cm diameter at the end. The pipe was used to get reduced weight with good strength and the GI pipe is rust-resistant and is easily wieldable. At the three ends, we used steel cylinders since they join the frame and wishbone to each other and the wishbone to the wheel hubs. The steel also used there so we can drill holes suitable bolts that Are already made and most stress concentrated point where the bolts are connected so we need more stability so we used steel cylinder there

Figure 5- Wishbone control arm

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4.3 WHEEL HUB

The wheel hub we are using is that of an auto-rickshaw. It is the front-wheel hub of the auto-rickshaws it is made from structural steel it is a 3 bolted system 2 bearing 1 roller and a ball bearing system. The second reason to take it is lighter the car hubs and the bolts in the system can be bolted to the bike wheel if we add 3 holes on the wheel hub of the bike tire. The turning radius is controlled by the cylinder part behind the hub it consists of 4 parts a threaded shaft a 1.25 GI pine and 2 balls bearing at the end. We did not do any analysis on the wheel hub system since it was premade and could withstand the whole weight of auto-rickshaws.

Figure 6– Wheel hub

4.4 BATTERY

The battery we use in the trike is a lithium-ion battery. We prefer lithium-ion battery over lead-acid battery because of its long life and charging speed. The weight was also a major factor as a lead-acid battery to produce the same volt and ampere the would almost 3 times about 30kg the lithium battery supplies 48 V and has a capacity 30AH it takes approximately about 5 hr to fully charge. It has a weight of about 10 kg. The max power developed by the battery is 1440W. The max power can be supplied for an hour. Our motor is that of 1000W so consider the watt for battery and its capacity the trike should able travel about 60 Km to a single charge

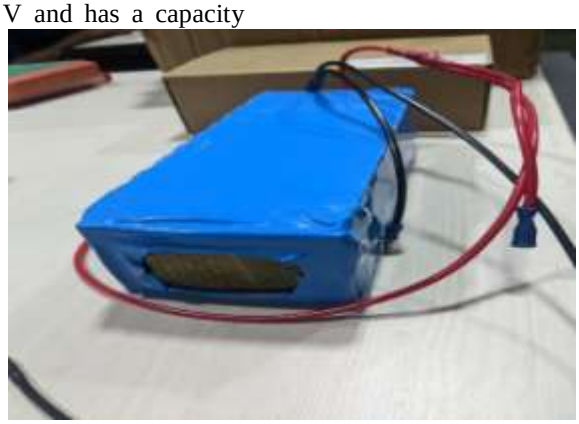

Figure 7 – Lithium ion Battery

4.5 CONTROLLER AND BLDC MOTOR

The motor uses a 48v and 25 amp of current produce power 1000W and use the motor has a peak power 1800W can supply a torque of 15Nm the max rpm is 3000. The motor has a speed rate- 10:1 and it also provides an insulation level - b. the motor has an IP68 rating meaning it is waterproof. The controller has a Nominal voltage- 48V and has a Lower cut-off- 42V. The controller work max up to 50 amps the Function provide with the controller are reverse, low braking, and high braking, centre lock system. The controller is also responsible for the sensor in the BLDC motor and connects the motor to the battery. the accelerator with battery indicator accelerator works at 48V and has 5 levels to show the battery percentage each level shows 20% charge the accelerator is used to control the amount of power transmitted to the motor it uses a potentiometer

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Figure 8 -BLDC motor and controller

V. FABRICATED DESIGN

The figure shown below the full assemble of the trike with motor steering wheels the trike but has a low clearance it can be improved by adjusting the suspension and welded V part that connects the suspension to each other. The battery is not shown in the above figure. The trike tilts about 30 degrees and can without a stand to hold it. 4 the trike has good stability and can accommodate a person up to 120 kg it is single person passenger model. And has a weight of 110 Kg. it travels at a speed up to 60 Km/h and has a travel range of about 55km on a full charge the system takes about 5 hours to fully charge the gear system allow for good torque control.

Figure 9- Tilting trike

VI. MERITS AND DEMERITS

6.1 Merits

- Has more stability compared to two-wheeler
- Can corner at a much higher speed due to tilting motion
- Has a lower centre of gravity since the frame becomes wider
- More braking power has 2 brakes in front
- Eco-friendly uses electric power
- Capable of going off-road double wishbone suspension system

6.2 DEMERITS

- Has a wider frame so difficult to travel in heavy traffic
- Has more weight due to additional frame and suspension
- Less efficient due to increased weight

VII. CONCLUSIONS

We have successfully designed and fabricated a prototype model of Tilting Reverse Trike which combined the advantages of reverse trike design, tilting mechanism & electric drive system. This reverse trike with the tilt suspension system has proved its capabilities in off-road terrains with improved stability and riding performances. We know that most of the accidents take place due to skidding of the front wheel in the sudden braking condition while taking a turn, our design has two wheels in the front and also the ability to tilt, which prevents the vehicle from skidding and losing control of the vehicle on road. Thus we can conclude that the performance, handling, and safety of the Tilting Reverse Trike are much better than any other commercially available three-wheelers

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