

All Terrain Bike

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Abstract: There are many off-roads where travelling with common type of vehicle is nearly impossible. To overcome this problem the main objective of our project is to build a foldable and portable bike named ATB. ATB is a vehicle designed mainly to overcome off-road. ATB is small sized and demountable vehicle. It can be de-assembled and take away in the bag. It reduced the transport dimensions we can remove the wheels, rear trunk, steering and seat. The main advantage of this vehicle is light weight which positively affects the convenience of control, especially in conditions of heavy off-road. In this vehicle rear wheel runs by engine with the help of chain drive.

Keywords: ATB, Chassis, Engine, Suspension, Tires, Brakes, Exhaust

1. Introduction

A vehicle is usually based on its ride, performance and handling. Performance refers to the ability of the vehicle to accelerate/decelerate, develop a drawbar pull, overcome obstacles etc. Ride is described in terms of the vibration excited by the vehicle due to road irregularities, engine noise, wind noise, transmission noise, tire noise etc. Among all these ride-affecting characteristics, road surface irregularities play a major role in affecting ride comfort. Vehicle handling relates to direction control and disturbance stabilization. A wide range of human activity such as agriculture, mining, construction, exploration, military operations, and recreation involves propulsion over unprepared terrains using specialized off-road vehicles. Methodological studies of the principles and design of off-road vehicles, therefore, have attracted considerable interest. In recent years, several advancing nations have proposed to design and fabricate All-Terrain Vehicles (ATV's). Many automotive companies produce ATV's with minor modifications in design for use in unprepared terrains such as for patrolling on beaches, recreation centers, motor sports and mines. The research mainly analyzes the ride comfort, handling and driver comfort of ATV's operated on unprepared terrains using a Semi-Active Suspension System (SASS). All-terrain bikes is a single sitter and the working principle is similar to the other motorbikes as shown in Fig. 1.1. The tires used here are deep threaded tires which are having studs that can be used both on-roads and off-roads. Here the motorbike is designed so as the whole bike can be dis-engaged in three parts. As all the bikes have, its own capacity and we cannot go long duration on that single bike only. Therefore, if we want to go on hiking then we can go up to the place on car with the bike dis-engaged and then with the short duration of time, we can engage it to travel the place where the car cannot go.



Fig. 1.1 All-terrain Bike

In our project, we are re-designing the whole bike. New deep threaded tires with the studs are used. The lock screw with the knuckle joint have been embedded to engage and dis-engage at the front shaft and at the suspensions. If there are any obstacles on hills where the bike also might not go then we can dis-engage it and put in a bag. Therefore, afterwards we can carry up to the point then we can again engage and carry on our journey. With the growing technology, we can vary the tires and the chassis of the bike can be made light using Nano-materials.

2. Literature Survey

In this chapter, a review of detailed literature survey, research done through internet and survey done with the help of different journals about normal bikes, foldable bikes, all-terrain vehicles and spark ignition engine presented. All-terrain vehicles (ATV's) were first developed and marketed in the U.S. in the 1970s. They have soared in popularity for occupational and recreational uses since that time. In 2008, there were approximately 10.2 million ATV's in use in the United States. In 2001, it was estimated that 23 million Americans rode ATV's, 69% were adults and 31% children. Deaths and injuries from ATV's have increased over time. According to the U.S. Consumer Product Safety Commission, Kentucky led the nation for ATV deaths from 2002-2006, with increasing numbers of fatalities annually. ATV's used on farms is increasing across the country because the vehicles provide an efficient and reliable replacement for horses and tractors for farm work, such as checking livestock, feeding, or fence repair. Aging farmers and farmers with physical disabilities can often increase their productivity by using ATV's for their transportation needs on the farm. ATV's also serve as an inexpensive and popular recreational vehicle used by families especially in rural areas. The two-stroke petrol engine was very popular throughout the 19th-20th century in motorcycles and small engine devices, such as chainsaws and outboard motors. It was also used in some cars, a few tractors and many ships. Part of their appeal was their simple design and often high power to weight ratio. The lower cost to rebuild and maintain made the two-stroke engine incredibly popular, until the EPA mandated more stringent emission controls in 1978 (taking effect in 1980) and in 2004 (taking effect in 2005 and 2010). The industry largely responded by switching to four-stroke petrol engines, which emit less pollution. Most small designs use petrol lubrication, with the oil burned in the combustion chamber, causing "blue smoke" and other types of exhaust pollution. This is a major reason why two-stroke engines were replaced by four-stroke engines in many applications. The two-stroke cycle is also used in many diesel engines, most notably large industrial and marine engines, trucks and heavy machinery. But, the two-stroke diesels don't burn their lubricating oil and two stroke petrol/gasoline engines don't have the emission problems according to P M Ku and T F Trimble [1]. The first successful design of a three port two-stroke Spark Ignition (S.I) engine was patented in 1889 by Joseph Day & Son of Bath. This employed the underside of the piston in conjunction with a sealed crank case to form a scavenge pump according to E Vielledent [2].

3. Selection of Components

The All-Terrain Bike is composed of many components so the selection of right components plays efficient role to produce a finished product. The main components used are:

- All-Terrain Tires
- Chassis
- Suspension system
- Braking system
- Engines
- Exhaust system

The Fig. 3.1 represents the real model of our project. Many design procedures have been followed for making the ATB so that it can run on any terrain. This ATB can be engaged and dis-engaged easily so that it is possible to take this ATB anywhere as per our demand.



Fig. 3.1 Engaged View

3.1 Tires

The tire that we have used in our project is buttoned tires. The Fig. 3.2 represents the front tire. We have used these kind of tires so that it can run on different terrains. The traction between the road surface and the tires is proper and the grips are also good. Between the tires thread there is a gap so that, when the mud gets attached on the tires then we can easily remove it when it is in contact with water. The water promotes the flow through the spaces that helps to keep the tire clean and prevent it from wearing off easily. The Fig. 3.3 shows the rear axle tires.



Fig. 3.2 Front Tire



Fig. 3.3 Rear Tire

3.2 Chassis

The chassis is known as the backbone of the ATB. Here it helps to sustain all the loads i.e. with the person and the attachment of whole other parts. The Fig. 3.4 shows the chassis that we have used for our project. An ATB chassis is a core structure of the motorcycle. It supports the engine, provide the location for the handle, rear suspension and support the rider or passenger. The material of the chassis we are using is steel.



Fig. 3.4 Chassis

3.3 Engine

The Fig. 3.5 represents the engine that we have used in our project. There are two types of engines i.e. two-stroke engine and four-stroke engine. Here for our project we are using two-stroke petrol engine. The two-stroke petrol engine is preferred due to its mechanical simplicity, lightweight and high power to weight ratio.



Fig. 3.5 Two-Stroke Petrol Engine

3.4 Suspension system

The suspension system are those that helps to absorb the shock and vibration of the whole bike and rider. The Fig. 3.6 shows the front suspension system that we have used in our ATB. For the front suspension system, we have used telescopic fork, which is most common in today's motorcycles. The main advantage of telescopic fork is that it is simple in design and relatively low cost to manufacture and assemble.

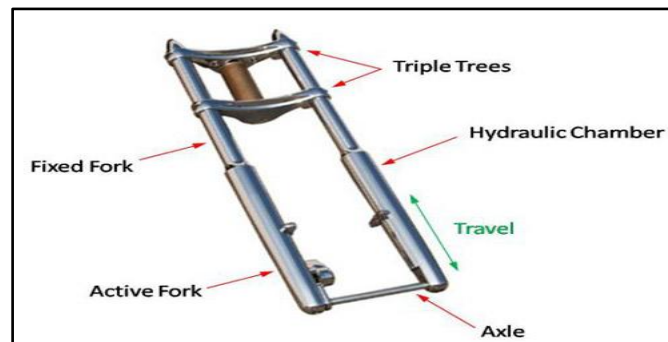


Fig. 3.6 Telescopic Fork Suspension

The Fig. 3.7 shows the rear suspension system that we have used in our project ATB. For the rear suspension system, we have used twin shock absorbers, which are most frequently used in off-road motorcycles. Twin shock absorbers are easy to use and make less design consideration for the overall bike design.



Fig. 3.7 Twin Shock Absorber

3.5 Braking System

The Fig. 3.8 shows the braking system that we have used in our project. This type of braking system are called drum brakes. The braking system provides necessary force to make the vehicle to slow down or to stop. The braking system are provided on both the front and back wheel. The type of braking system we are using is drum brake on both the wheels.



Fig. 3.8 Drum Breaks

3.6 Exhaust System

The Fig. 3.9 shows the exhaust system that we have used in our project. It is called as the silencer pipe or chamber. For two-stroke type of engine, we use this type of exhaust system. The movement of ATB in different terrain requires high torque so this type of exhaust system helps in giving high power and torque.



Fig. 3.9 Exhaust Chamber

3.7 Dis-engaged view

The dis-engaged view of the project is as shown in the Fig. 3.10 that we have managed to de-assemble the ATB into three main divisions and other sub-divisions.



Fig. 3.10 Dis-engaged View

4. Conclusion

This project begins with a modification and design parameter for the movement of ATB in different terrains. In this ATB, buttoned tires are used that helps to provide proper traction and high rolling resistance. Here we can easily engage and dis-engage the bike within short duration of time. At first the handle part and front wheel is dis-engaged as there is screw and nut joint arrangement. Secondly, one main rod is being placed at the bottom of v arrangement of chassis by which we can easily dis-engage the rear wheel of the vehicle. Therefore, the whole ATB differentiated into three parts along with the engine and the chassis. Due to this division of ATB into three parts helps in transferring the whole bike in different places as per our wish. It is easy to carry these dis-engaged parts and we can easily engage and ride it.

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