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Design and Fabrication of Go-Kart

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ABSTRACT:

Our project is to **DESIGN AND FABRICATION OF GO-KART.** Main motto of us is to design a Go-kart using 4-stroke diesel engine. The maximum speed range of this will be of 40 km. Material used for the construction of frame is mild-steel. Maximum weight which can be placed on this will be of 200 kilograms. The designing of this go-kart will be in the form of **F3** racing car. Drum brake is placed to the rear wheel. Main purpose of this is for racing and used as re-creation purpose. Pitman arm steering mechanism is used.

KEY WORDS:

4-Stroke, diesel engine, F3 car, Drum brake, re-creational purpose, pitman arm steering mechanism.

I. INTRODUCTION:

In the 1950's a group of thrill seekers in Southern California welded together a crude frame from steel tubing, mounted it on wheels intended for wheel barrows, powered the contraption with a small 3 HP engine intended for lawn movers and raced it around the parking lot of the Rose Bowl in Pasadena. These vehicles, now called "go-karts" have grown into a multi-billion dollar industry in the USA and throughout the developed world. They are made, sold, and used exclusively as recreational racers. These vehicles are typically 30 inches wide, 4 to 5 feet long, and weight between 50 and 70 pounds. They are simple and inexpensive to build and operate and they can travel on rough terrain and roads at speeds exceeding 20 miles per hour. Normally a 30-inch wheelbase is used with 1" by 36" threaded axles and 3 to 6 inches of ground clearance depending on type of terrain the vehicle is expected to traverse. A very elementary steering system of the tie-and-rod variety is sufficient. Brakes may be 4-1/2 inch band or drum design. Eight-inch to 14-inch standard wheels from the garden supply industry may be utilized. The other significant components are the clutch and sprocket assembly, bearings, and a throttle control assembly.

Bicycles, rickshaws, and rickshaw-based vehicles called "vans" are also manufactured in small shops throughout the country. Truck maintenance shops provide yet another source of technical skill that may be adapted for the introduction of go-karts to the country as a cottage industry in a de-centralized implementation. There are many motor sports in the world. Bikes, Cars, Formula one are examples of them. The drivers in these are very professional. They can drive it very fast. But there are also motor sports which do not need professional drivers and need no great speed. The vehicles used are also very cheap. Such a motor sport is Go-Karting. They resemble to the formula one cars but it is not as faster as F1 and also cost is very less. The drivers in go-karting are also not professionals.

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Even children can also drive it. Go-karts have 4 wheels and a small engine. They are widely used in racing in US and also they are getting popular in India.

II. SYSTEMS:

1. Fuel system
2. Ignition system
3. Lubrication system
4. Cooling system

1. Fuel System:

The purpose of fuel system in CI engines is to store and supply fuel and then to pump to carburetors. The fuel supply system also prepares the air-fuel mixture for combustion in the cylinder and carries the exhaust gas to the rear of the vehicle. The basic fuel supply system used in the vehicle consists of the following.

a) Fuel tank
b) Fuel strainer or Fuel filter
c) Air cleaner
d) Carburetor

2. Ignition System:

The ignition system used for small two-stroke engine is flywheel magneto type. The advantage of this system is that it is set combined. The flywheel magneto is basically used only for a single cylinder engine though ones suitable for multi-cylinder engine have also been developed. The principles of this type of ignition can be easily understood with following description.

1. Ignition Coil
2. Spark Plug
3. Ignition Switch
4. Flywheel Magnet

Ignition Coil:

The coil consists, in fact, of two coils which may be considered as separated electrically, although they are both wound on the same iron core and share a common terminal. One coil, known as the primary, is fed from the battery, and the principle of operation depends upon the fact that, if the supply to this coil is suddenly interrupted, then the voltage is created or induced in the other coil known as the secondary. The voltage in the two coils can be considered for our purpose to be in the same ratio as the number of turns of wire on the two coils, so that by providing relatively few turns on the primary winding, and a very large number on the secondary the necessary, high voltage is obtained. The voltage required to cause a spark between the sparking plug points depends upon both the pressure of the mixture with the cylinder and the gap between the points under average conditions a voltage of the order of 10,000 volts is needed. Earlier it has been stated that the development of the higher voltage in the secondary winding of the ignition coil only occurs when the electricity supplied to the primary winding is suddenly interrupted. This interruption is arranged to take place at the correct time by the contact breaker points.

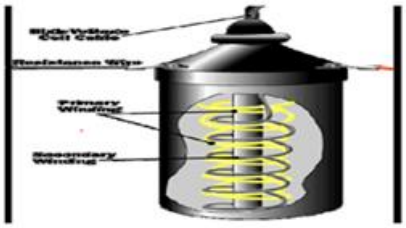

Fig : 2.2 Ignition coil

Spark Plug:

An essential part of the ignition system is the provision of electrodes within the engine cylinder, across which the ignition spark can discharge. It is desirable to arrange that these electrodes shall be easily accessible and they are, therefore, mounted on a screwed-in plug. A sparking plug consist essentially of a steel body which bears the earthed electrode, an insulator, and a central rode which forms the other electrode, fed from the distributor. The lower part of the body is threaded to suit a screwed bole provided in the engine, the length of the threaded portion known as the reach and varying with the plug design. The body of the plug seats on to a soft steel washer when it is screwed into the engine. The insulator operates under particularly arduous condition since not only must it withstand the high ignition voltage, but it's lower and is subjected to the full bear of combustion and it is also liable to mechanical shock. At one time, the insulator was mode from porcelain but modern plugs use ceramics based on sintered aluminium- oxide.

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The central electrode is seated into the insulator and is provided with a screwed terminal at the upper exposed end, often shaped on connector. The tip of the electrode, at which the spark occurs, usually has an insert of heat-resisting metal such as nickel. The ignition voltage is about 25,000 volts and the distance between the central and earthed electrodes is about. 202 inch and is adjusted by bending the outer electrode.

3. Lubrication System:

It is a common known that if two rough surfaces are rubbed together, there is a resistance to the motion and heat is generated. In an IC engine surface which rubs together are not tough by normal standards, yet if they are allowed to run in direct contact get one another, the temperature more rise to so high a degree that local melting will occur and the surfaces will slide to seize. It has been shown than even if the surfaces are super finished, seizing will occur unless lubrication is provided.The primary objective of lubrication is to reduce the friction and wear between bearing surface. Lubrication accomplishes this requirement by interposing a film of oil between the sliding surfaces. Other function of lubricating oil in internal combustion engines are, such as the pistons by packing up heat and dissipating it through the crank case and reducing compression losses by acting as a seal between the cylinder walls and piston rings.

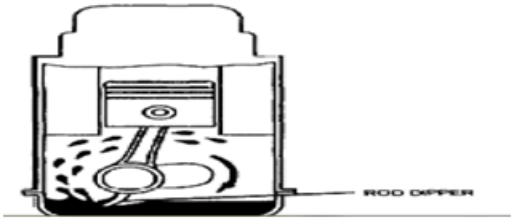

Fig: 2.4 Lubrication system

4. Cooling System:

A lot of energy is produced due to the combustion of fuel inside the engine cylinder. Only 30% of heat energy is converted into mechanical work. Out of the remaining heat (about 70%) about 40% is carried away be exhaust gases into the atmosphere. The remaining part of heat energy(about 30%) is absorbed by engine cylinder, cylinder head, piston and engine valves. It causes thermal stress in the engine parts, reduces strength of the piston, decomposition of lubrication oil, burning of valves and it also reduces the volumetric efficiency of the engine.

III PARTS:

In a Go-Kart, there are mainly seven parts. They are,

1. Chassis
2. Engine
3. Steering
4. Transmission
5. Tyres
6. Brake
7. Electric Starter

CHASSIS:

The chassis is an extremely imported element of the kart, as it must provide, via flex, the equivalent of suspension to give good grip at the front. Karts have no suspension, and are usually no bigger than is needed to mount a seat for the driver and a small engine. Chassis construction is normally of a square rod construction, typically MS with different grades. In this kart, we use MS rod with 1” diameter. The chassis support the power unit, power train, the running system etc.

Engine:

An engine of a go-kart is usually a small one about 80cc. In this kart, we use a kinetic Honda Single Cylinder 98cc 2-stroke petrol engine, which produces about 7.7 BHP@5600 rpm.. Weuse 2- stroke engine because this is used for racing. So there is no need of mileage.

Steering system:

The steering of a go-kart is not that much sensitive because we used mechanical steering mechanism but not rack and pinion mechanism.

Rack and pinion mechanism is much costlier compared to mechanical steering mechanism.

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Transmission:

Transmission means the whole of the mechanism that transmits the power from the engine crankshaft to the rear wheels. In this vehicle, the power from the engine is transmitted to the sprockets using chain, i.e. this is chain drive. The driver sprocket has 9teeth and driven sprocket has 45 teeth. Usually go-karts do not have a differential and so we eliminate differential from our vehicle also. And also this go-kart has no clutch and gears because this is automatic transmission. The power from the engine is transmitted to the rear two wheels using chain drive. We use chain drive because it is capable of taking shock loads.

Introduction:

The word 'transmission' as introduced in the beginning of this book means the whole of the mechanism that transmits the power from the engine crankshaft to the rear wheels.

Necessity of Transmission: The question as to how far is the transmission necessary in a vehicle may be answered by considering.

- Variation of resistance to the vehicle motion at various speeds.
- Variation of attractive effort of the vehicle available at various speeds.

Tyres:

For go-karts, wheels and tyres are much smaller than those used on a normal car. The tyres will have increased grip and a hard one. And also it can withstand the high temperature. In this kart, we use tyres having 15" dia for front and for rear. This is used for an aerodynamic shape. The tyres must have pressure of at least 18 psi.

Brake:

Principle:

A drum brake is a brake that uses friction caused by a set of shoes or pads that press against a rotating drum-shaped part called a brake drum. It goes without saying that brakes are one of the most important control components of vehicle. They are required to stop the vehicle within the smallest possible distance and this is done by converting the kinetic energy of the vehicle into the heat energy which is dissipated into the atmosphere. The term drum brake usually means a brake in which shoes press on the inner surface of the drum.

Electric start:

Both Otto cycle and Diesel cycle internal-combustion engines require the pistons to be moving before the ignition phase of the cycle. This means that the engine must be set in motion by an external force before it can power itself. Originally, a hand crank was used to start engines, but it was inconvenient and rather hard work to crank the engine up to speed. It was also highly dangerous. Even though cranks had an overrun mechanism to prevent it, when the engine started, a crank could begin to spin along with the crankshaft. The operator had to pull away immediately, or else risk a broken wrist, or worse. Moreover, as engines evolved, they became larger and compression ratios increased, making hand cranking an increasingly difficult matter.

IV .STEERING:

Steering Shaft and Pitman Arm

Your steering shaft connects the steering wheel to the Pitman arm, and runs through a protective tube.

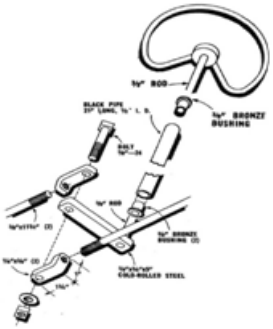

Fig: 3.1 Steering wheel to pitman arm

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Fig : 3.2 Tie rod

Tie Rods:

Tie rods are very simple to make, and expensive in comparison. The tie rods that connect in the diagram are also 3/8" rod, with 3/4"x1/4" flat stock used to make the ends. A galvanized bolt holts the entire assembly together. To make your own tie rods, simply take 1/4" x 3/4" x 1.5" flat stock and make the "U" shape in the Fig. 5. Use an inside diameter of about 7/16" to allow movement and the inclusion of an adjustment nut. At least one end of your tie rod needs to be adjustable so you may align your steering properly. Once you've completed the "U", drill a 1/4" hole in the short side and weld a 1/4" bolt inside.

Adjust the Steering:

You can get better handling through the proper alignment of the steering. By adjusting the alignment to a slight toe in (as suggested by the diagram) you'll get better turning. However you'll also eat up the tires faster since the wheels don't run perfectly straight. This isn't really needed for fun karts, but is used widely in the racing world.

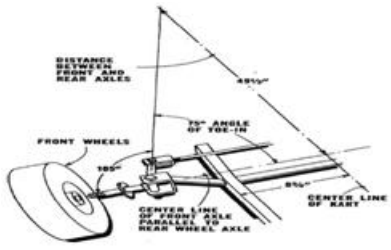

Fig : 3.3 Steering Adjustment

Fig : 3.4 Adjusted Steering

Procedure to Wheel alignment:

1. First straight the front wheels by adjusting steering wheel.
2. Then lock the steering wheel.
3. Loosen the tie rod nuts of the both side by using wrench.

Adjust the tie rods until the wheels vertically straight.

V. FABRICATION:

Chassis:

First of all, the chassis is constructed. The MS pipe is taken as per dimensions and bends in required places using bending machine. Then the pipes are welded.

Axle:

The required shaft is taken as per the dimensions and turned on the lathe.

Sprocket:

The sprocket is welded on the axle at required place.

Brake:

The brake is also placed in the axle near to the tyre. The boredom is connected to it and is connected to left pedal in front of kart.

Accelerator:

The accelerator pedal is placed is the right side of the front of the kart and is connected to the engine.

Engine:

The engine is mounted in the chassis and the chain is connected to the sprocket and engine.

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Fuel tank:
The fuel tank is placed in the upper position of the engine level using welding technology.

Rear wheels and tyres:
The 2 wheels are connected to the both ends of the axle and welded together. Then the assembly is connected to the chassis using 2bushed bearing.

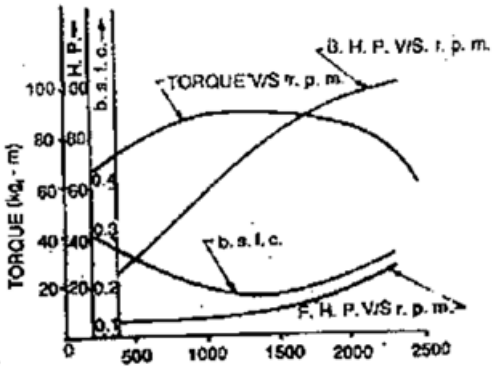
Steering:
The steering spindle and steering are made as per the dimensions and bolted together. This is connected to the Pitman arm steering mechanism. This mechanism is connected to the 2 front wheels.

Seat:
First the seat is cushioned and then mounted on chassis using bolts.

Electric start:
The battery is placed and connected to the starting motor using wires. And the switch is placed in the steering spindle stand.

Painting:
The painting is done to increase the appearance to the kart. The chassis, steering and steering spindle, wheels, seat, muffler, engine cover etc are painted.

VI .PERFORMANCE STUDY:
First of all, we say that this is not a performance machine. We are taking a two – wheeled engine and connected to four wheels. So the performance also deferrers. We tested this vehicle at standard conditions. Engines are tested to find out the variations of Brake Horse Power, Torque, Fuel Consumption, Frictional Horse Power and Specific Fuel Consumption at different engine speeds.

Performance Curves:


FUTURE SCOPE:
Go-Karting is a big craze to the Americans and Europeans. It is initially created in United States in 1950s and used as a way to pass spare time. Gradually it became a big hobby and other countries followed it. In India go-karting is getting ready to make waves. A racing track is ready in Nagpur for go-karting and Chennai is also trying to make one. Indian companies are also producing go-karts in small scale. MRF and Indus motors are the major bodies in karts and they are offering karts between 2lakh and 3 lakh. But to make go-karts popular, the price must come down. For that, many people are trying to build one under 1 lakh and we had also take up the challenge. A go-kart just under Rs. 49,000/-. So we are sure that our project will have a high demand in the industry.

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