

Electromagnetic Clutch Braking System with IR Sensor

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Abstract— This paper reveals the fabrication of Electromagnetic clutch braking system with IR sensor. Automotive vehicles are increasingly being equipped with collision avoidance and warning system for predicting collision with an external object, such as another vehicle or a pedestrian. Upon detecting a potential collision, such system typically initiates an action to avoid the collision and/or provide a warning to the vehicle operator. The braking system consists of IR transmitter and receiver circuit and the vehicle. The IR sensor is used to detect the obstacle. There is any obstacle in the path, the IR sensor senses the obstacle and giving the control signal to the microcontroller, which in turn send signal to the motor to stop and also to the solenoid so as to stop the vehicle as programmed. An electromagnetic clutch is a device used to make and brake contact from the transmission operate electrically but transmit torque mechanically. An electromagnetic braking system uses magnetic force to engage the brake but the power required for braking is transmitted manually. The disc is connected to a shaft and the electromagnet is mounted on the frame. The eddy current is created by the relative motion between a magnet and a metal (or alloy) conductor. The reverse magnetic field is induced which results in the deceleration of motion. This proposed the mechanism which implements this phenomenon in developing and electromagnetic clutch and braking system. This reduces complication to control of clutch and brakes.

Key words: Clutch, IR Sensor, Helical Gears, Microcontroller, DC Motor

I. INTRODUCTION

The most important for today's society and economy is safety. When a safety factor of a vehicle is considered a primary factor that flashes in mind is its brakes or braking system. Braking is basically a mechanical action applied for slowing down of vehicles or even making the vehicle coming to halt depending upon the circumstances. Thus a braking is always needed to ensure the safety of the drivers and passengers uncountable valued lives.

II. HARDWARE DESCRIPTION

- Mechanical Components
 - 1) Dynamo
 - 2) Electromagnetic Clutch
 - 3) Wheel
- Electronic Components
 - 1) Relays
 - 2) Transistor
 - 3) IR Sensor
 - 4) Integrated Circuit
- Electrical Components
 - 1) Power Supply
 - 2) Multimeter

III. EXPERIMENT

The electromagnetic clutch is a device which is a device which is used for the engagement and disengagement electromagnetically with the help of electromagnet and a relay with provides better usage of an electromagnet to stop and apply different clutch and brakes. Therefore activating the unit with electric current, the coil gets energized and current running through coil generates a magnetic field. Magnetic flux overcomes air gap between armatures and connect to hub. Armature and hub are accelerated to match rotor speed. In brakes magnetic field acts directly between field and armature field acts on magnetic frame or on torque arm that handles brake torque. As armature contacts field, braking torque gets transferred into field housing, decelerated load.



Fig. 1: Working Prototype of Car with Electromagnetic Clutch Braking System with IR Sensor.

The main parts of the clutch braking system with IR sensor are Clutch, DC motor, helical gear, IR Sensing circuit, and power source.

A. Clutch

A single plate friction clutch consisting of a clutch disk between the flywheel and a pressure plate. Both the pressure plate and the flywheel rotates with the engine crankshaft or the driving shaft. And both sides of clutch disc are faced with friction material (usually of ferro do). The clutch disc is mounted on the hub which is free to move axially along the splines of the driven shaft but not turn able towards the transmission input shaft. In this clutch disc (center) spins with the flywheel (left). To disengage, the lever is pulled (black arrow), causing a white pressure plate (right) to disengage the green clutch disc from turning the drive shaft, which turns within the thrust-bearing ring of the lever. Never will all 3 rings connect, with no gap.

B. DC Motor

A motor is an electrical machine which converts electrical energy into mechanical energy. The principle of working of a DC motor is that "whenever a current carrying conductor is placed in a magnetic field, it experiences a mechanical force".

The motor or an electrical motor is a device that has brought about one of the biggest advancements in the fields of engineering and technology ever since the invention of electricity. A motor is nothing but an electro-mechanical device that converts electrical energy to mechanical energy.

C. Helical Gear

Helical or "dry fixed" gears offer a refinement over spur gears. The leading edges of the teeth are not parallel to the axis of rotation but are set at an angle. Since the gear is curved, this angling makes the tooth shape a segment of a helix. Helical gears can be meshed in parallel or crossed orientations. A gear or cogwheel is a rotating machine part having cut teeth, or cogs, which mesh with another toothed part to transmit torque. Geared devices can change the speed, torque, and direction of a power source. Gears almost always produce a change in torque, creating a mechanical advantage, through their gear ratio, and thus may be considered a simple machine. The teeth on the two meshing gears all have the same shape. The gears in a transmission are analogous to the wheels in a crossed, belt pulley system. An advantage of gears is that the teeth of a gear prevent slippage.

D. IR Sensor

An infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measure only infrared radiation, rather than emitting it that is called as a passive IR sensor. In this IR detector and transmitter circuit the IC 555 is working under constable mode. The pin 2 i.e. trigger pin when grounded via IR receiver, the pin 3 output is low. As soon as the IR light beam transmitted is obstructed, a momentary pulse actuates the relay output (or LED). The IR transmitter is simple series connected resistor network from battery. The timing capacitor connected to pin 6 and 7 ground. The time can have varied as per requirement by changing the R value.

E. Power Source

Perhaps all of you are aware that a 'power supply' is a primary requirement for the 'Test Bench' of a home experimenter's mini lab. A battery eliminator can eliminate or replace the batteries of solid-state electronic equipment and the equipment thus can be operated by 230v A.C. mains instead of the batteries or dry cells. Nowadays, the use of commercial battery eliminator or power supply unit has become increasingly popular as power source for household appliances like trans-receivers, record player, cassette players, digital clock etc.

IV. ADVANTAGES

- Electromagnetic brakes can develop a negative power which represents nearly twice the maximum power output of a typical engine.
- Electromagnetic brakes work in a relatively cool condition and satisfy all the energy requirements of braking at high speeds, completely without the use of friction. Due to its specific installation location (transmission line of rigid vehicles), electromagnetic brakes have better heat dissipation capability to avoid

problems that friction brakes face times the braking power of an exhaust brake.

- Electromagnetic brakes have been used as supplementary retardation equipment in addition to the regular friction brakes on heavy vehicles.
- An electromagnetic brake has great braking efficiency and has the potential to regain energy lost in braking.
- Its component cost is less.

V. APPLICATION

- Used in crane control system.
- Used in winch controlling.
- Used in lift controlling.
- Used in automatic purpose.

VI. CONCLUSION

The need has long existed for an improved clutch for automotive vehicles. It is highly desirable that it can be operated alternatively in the vehicle and safety for both passenger and vehicle. Further, it should be stable and easily applicable with minimum effort. Thus, the product has been developed considering all the above requirements. This particular design of electromechanical clutch will prove to be beneficial in avoiding accident and effortless transmission.

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