FABRICATION OF HAND OPERATED IN CLUTCH IN FOUR WHEELS

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Abstract—A clutch is the mechanism for transmitting rotation, which can be engaged and disengaged. These are useful in devices that have two rotating shafts. One is typically driven by motor and the other shaft drives another device. But by using these, the driver can’t press the clutch pedal while slowing down and we get more accidents in the highways in high speeds. To overcome these kinds of incidents in the future, the following purpose can be used. This revels about the design of a hand operated clutch, by using electromagnetic in automobile technology. This can be mainly used in vehicles such as either in two or four wheelers, and can also be used in real time applications in the industries. It encourages the design and operation in which it is very simple and easy to construct in a heavy vehicle also. It has less economy and different properties of materials can also be constructed in this project.

Keywords---- Features of clutch, Motor, Electromagnetic clutch, Microcontroller control unit, Arrangement of the clutch.

1. INTRODUCTION

In an automobile vehicle, there are many different vehicle clutch designs, but most are based on one or more friction discs, pressed tightly together or against a flywheel using some springs. The friction material varies in composition depending on whether the clutch is dry or wet, and on another consideration. Clutches found in heavy duty applications such as trucks and competitions cars use ceramic clutches that have greatly increased friction coefficient, however these have a “grabby” action and are unsuitable for road cars. It is therefore, necessary that the driven shaft should be disengaged from the driving shaft. Also the clutch disconnects the engine from the transmission to change the gear. It provides a positive linkage for transmitting the maximum engine torque at high speed of the vehicle requiring direct coupling of the engine to the transmission without any leakage of the power. The engagement and disengagement of a clutch is usually operated by a lever. But in clutch-by-wire method, it has no mechanical link between the clutch and the pedal. It is electronically controlled by means of an Electronic Control Unit (ECU) and an actuator. The main disadvantage of that method was the wires should be made enough strong to require much force and power when pressing the clutch and a lot of accidents was occurred from that test. In this we are using a button or a switch in the top of the gear lever to press the clutch, thus cutting off the current to the electromagnet and disengaging the clutch.

2. FEATURES OF CLUTCH

i. There must be not much excessive force to separate the drive from the clutch.

ii. There must be an equitable coefficient of friction in the clutch friction surface in all working conditions.

iii. It should provide adequate cooling or ventilation to dissipate heat generated.

iv. The material used for clutch must have adequate thermal conductivity to dissipate heat, so distortion to flywheel and pressure-plate is avoided.

v. It should withstand high temperatures and clamping loads without crushing.

vi. The clutch surface should be hard enough to resist wear but not much hard to cause scoring.

vii. A clutch free pedal play must be provided in the clutch to reduce the load on the thrust bearing and wear respectively.

viii. It should be cheap and easy in manufacture.

3. MACHINE COMPONENTS

The constructions of the machines are much simple in which it require less economy than the original clutch procedure. The clutch button or the switch is the alternative used in the original clutch pedal respectively. The hand operated clutch in four wheels consists of the following components to fulfill the requirements of complete operation of the machine.

A. Motor.
B. Belt and Pulley.
C. Control Unit.
D. Electromagnetic Hand Clutch.
E. Vehicle Model.

3.1 MOTOR PRINCIPLE
A machine that converts direct current power into mechanical power is known as D.C. motor. Its generation is based on that principle that when a current carrying conductor is placed in a magnetic field, the conductor experiences a mechanical force. The direction of this force is given by Fleming’s left hand rule.

Suppose the conductors under N-pole carry current into the same plane of paper and those under S-pole carry current out of the plane of paper as shown in the fig. It can also be said that the N-poles carry current in clockwise direction and S-poles carry current in anticlockwise direction. Since each armature conductor is carrying current and is placed in the magnetic field, mechanical force acts on it. Applying Fleming’s left hand rule, it is clear that force on each conductor is tending to rotate the armature in anticlockwise direction. All the forces add together to produce a driving torque which sets the armature rotating. Consequently the direction of force on the conductor remains same.

Every DC motor has six basic parts – axle, rotor (armature), stator, commutator, field magnet and brushes. In most common DC motors, the external magnetic field is produced by high-strength permanent magnets. The stator is the stationary part of the motor which includes the motor casing, as well as two or more permanent magnet pole pieces. The rotor rotates with respect to the stator. The rotor consists of windings, the windings being electrically connected to the commutator. The above diagram shows a common motor layout—with the rotor inside the stator (field) magnets. Given our example, two-pole motor, the rotation reverses the direction of current through the rotor winding, leading to a “flip” of the rotor’s magnetic field, driving it to continue rotating. There is moment where the commutator shorts out the power supply. This would be bad for the power supply, waste energy, and damage motor components as well.

3.2 BELT AND PULLEY

3.2.1 BELT:

Belts are used to mechanically link two or more rotating items. They may be used as a source of motion, to transmit power at up to 98% efficiency between two points, or to track relative movement. As a source of motion, a conveyor belt is one application where the belt is adapted to continually carry a load between two points. A belt may also be lopped between two points so that the direction of rotation is reversed at that other point. Power transmission is achieved by specially designed belts and pulleys. The demands on a belt drive transmission system. Belts normally transmit power only on the tension side of the loop.

3.2.2 PULLEY:

Pulley is the one which is used to transmit the power from the motor and used to lift
heavy loads by the use of a conveyor belt produced on it. A pulley is a wheel with a groove along its edge, also called a sheave, for holding a rope or cable. Pulleys are usually used in sets designed to reduce the amount of force needed to lift a load. The magnitude of the force is reduced, but it must act through a longer distance. The effort needed to pull a load up is roughly the weight of the load divided by the number of wheels. The pulleys and lines are weightless, and that there is no energy loss due to friction. A second basic equation for the pulley follows the conservation of energy the product of the weight lifted times the distance it is moved is equal to the product of the lifting force times the lifting line is moved.

3.3 MICROCONTROLLER UNIT

Microcontrollers are destined to play an increasingly important role in revolutionizing various industries and influencing our day to day life strongly that no one can imagine. A microcontroller is a complete microprocessor system built on a single IC. This means that the idea of using a microprocessor for low cost products comes up often. An typical 8-bit microprocessor is expensive such that which need additional circuits to make an large amount of microprocessor. To solve this problem microprocessor system is implemented with a single chip microcontroller. Today microcontrollers are very commonly used in wide variety of intelligent products. The process of a microcontroller is first it fetches the instructions stored in the memory and determines the type of instruction and it executes the program according into it. Here the data is stored in the CPU which acts upon the type of function produced on it. Here the input ports are the D.C motor which sends the information to the CPU, the data memory which is stored in the CPU will senses the program memory with the timing of the clock pulses to be generated to the output ports of electromagnetic clutch. The kind of memories which is stored are engaging, disengaging of clutch, for braking purposes, slowing down the vehicle etc..

3.4 ELECTROMAGNETIC HAND CLUTCH

Electro Magnetic Clutch

An electromagnetic clutch is a clutch (a mechanism for transmitting rotation) that is engaged and disengaged by an electromagnetic actuator. These clutches are most suitable for remote operation since no linkages are required to control its engagement. It is fast and smooth operation. However, energy dissipates as heat in the electromagnetic actuator every time the clutch is engaged, there is risk of overheating. When the electromagnetic clutch is used in automobiles, there may be a release switch inside the gear lever. The driver operates the switch by holding the gear lever to change the gear, thus cutting off the current to the electromagnet and disengaging the clutch. With this mechanism, there is no need to depress the clutch pedal. During normal operation, the electromagnetic force of the winding is regulated by means of an electrical resistance, which itself is controlled by means of an accelerator pedal. As the acceleration pedal is pressed the resistance is gradually cut, thus increasing the electromagnetic force. A smaller electromagnetic clutch connects the air conditioning compressor to a pulley driven by the crankshaft, allowing to cycle only when needed. The electromagnetic type of clutch is suited where remote operation is desired since no linkages are required to control the engagement.

4. ARRANGEMENT AND WORKING OF HAND OPERATED CLUTCH

4.1. ARRANGEMENT
The components which are designed and the numbers in the above fig. indicate it has the required components present:-

1. BUTTON OR SWITCH.
2. GEAR LEVER.
3. D.C MOTOR.
4. ELECTROMAGNETIC CLUTCH.
5. WHEEL.
6. FRAME STAND.

4.2. WORKING PRINCIPLE

The hand operated clutch is operated by a motor power. Here we are using a PMDC motor. It is highly strength with a permanent magnetic field creating motor. A keypad is used for giving data to the microcontroller. It is a temporary storage device which also will be activating by a relay. Motor power transmits and clutch operates by using the belt and pulley drive. The microcontroller will work according to our object which is already programmed by the data. The microcontroller activates the driver circuit as per mentioned in the program. The driver circuit is constructed with a transistor which acts as switch to control the relay. The relay output is directly connected to the motor which is attached in the clutch assembly by using the belt drive. By this the clutch is operated by rotating the belt drive and the engagement is connected through another shaft, and another shaft is connected with the belt and pulley for the rotation of wheels for moving of vehicle. For putting the vehicle in a neutral position, the button is pressed twice and the gears are engaged in the neutral condition.

APPLICATIONS

1. It is applicable in all types of four wheelers and heavy vehicles.
2. These clutches are used from copy machines to conveyor drives.
3. Also used in packaging machinery, printing machinery, food processing machinery and factory automation.

MERITS

1. Economical.
2. Human safe.

3. Electromagnetic care performance is good.
4. Physical and Mechanical properties of materials are safe.

FUTURE SCOPE

The initial cost of the project can be reduced by using some other equipment which is suitable on it. A lesscare must be taken to find out the type of material used. Less heat capacity should be provided and a there should be a limited temperature rating of insulation of the magnetic coil.

5. CONCLUSION

The experimental information obtained showed that it's really possible to come up with a hand operated clutch with the use of motor. The gear lever which as an switch at the top of the lever, which the button is pressed and the gear is engaged or disengaged within the timing and it requires much less time than the clutch pedal function. The electromagnetic clutch doesn’t require much friction force than the single plate or the multi plate clutch. The control unit controls the timing and the action which is pre-programed in the data memory and does the work accordingly. The vehicle can run in a smooth operation and can be avoided with sudden accidents and can be used in traffics.

REFERENCES

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