AUTOMATIC SINGLE PLATE CLUTCH USING CENTRIFUGAL ACTION

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Abstract - *In automobiles Clutch is one of the most essential components. It is located between the gear box and the engine. It is also used in the transmission system of a vehicle to disengage and engage the transmission system from the engine. The most important function of the clutch is to initiate the motion and increase the velocity of the vehicle by transferring kinetic energy from the engine flywheel. It works on the principle of friction. Especially, for their durability and compactness the precise prediction technique of maximum structural stress should be requested in design of mechanical clutches. In this the study of a simple transmission system consisting of engine, clutch, gearbox and load is designed for the load lifting application.*

Key Words: Single plate automatic clutch, Bob-weight, Centrifugal force, Friction Materials.

1. INTRODUCTION

The clutches are designed to transfer maximum torque with minimum heat generation. The wheels should be disconnected from the engine in order to stop the vehicle without stopping the engine, which facilitates through clutch, which is a mechanism for transmitting rotation which can be engaged and disengaged.
It has been seen that internal combustion engine, does not produce high power at low speed. So that the engine must be rotating at a speed at which sufficient power is developed, before the drive to the wheels to be established. The clutches used must allow the drive to be taken up smoothly so that the vehicle can be gradually moved away from the stationary position. Once the drive is moving, it will be necessary to change gear and so disengagement of the engine or transmission is required. These two duties can be performed by various mechanical or other mechanisms or the friction system is considered, which a mechanical type of mechanism.

1.1 FRICTIONAL CLUTCHES

Frictional clutch has its principal applications in transmission of power of shafts and machines which must be started or stopped frequently. In cases where power is to be delivered to machines partially or fully loaded. In automobiles to connect engine to the driven shaft

1.1.1 ESSENTIAL FEATURES OF CLUTCH

a. Contact surfaces should develop a frictional force that may pick up and hold the load with reasonably low pressure between contact surfaces.
b. Heat of friction should be rapidly dissipated and tendency to grab should be minimum.
c. Surfaces should be backed by a material soft enough to ensure reasonably uniform distribution of pressure.

1.1.2 TYPES OF FRICTIONAL CLUTCHES

1. Disc or plate clutches
   a. Single plate or disc clutch
   b. Multi plate or disc cluch
2. Cone clutches
3. Centrifugal clutches

1.1.2.1 SINGLE PLATE OR DISC CLUTCH

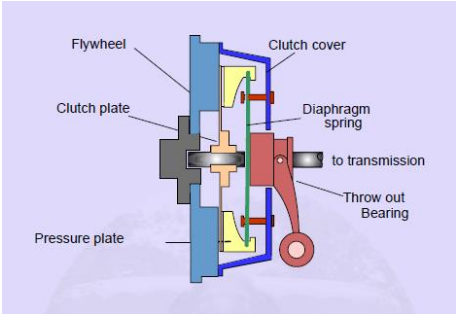

Fig -1: SINGLE PLATE OR DISC CLUTCH

Single plate clutch consists of a clutch plate whose both sides are lined or faced with friction material usually feredo. It is mounted on a hub which is free to move axially along splines or key way on the driven shaft. Pressure plate is mounted inside the clutch body which is bolted to flywheel. Both pressure plate and flywheel rotate with engine. Pressure plate pushes clutch plate towards flywheel by a set of strong springs arranged radially inside body.
Three levers called release levers or fingers are carried on pivots suspended from the case of body. Levers are arranged such that pressure plate moves away from flywheel by inward movement of thrust bearing. Thrust bearing is

mounted upon a forked shaft, moves forward when clutch pedal is pressed.

When clutch is pressed down; linkage forces thrust bearing to move in towards flywheel pressing longer ends of levers inwards. Levers are forced to turn on the suspended pivots and pressure plate moves away from the flywheel by knife edges thereby compressing the clutch springs.

This action removes pressure from the clutch plate and thus moves back from the flywheel, driven shaft becomes stationary. When foot is taken off the clutch pedal thrust bearing moves back by levers; allows the springs to extend thus pressure plate towards flywheel.

The axial pressure exerted by spring provides frictional force in the circumferential direction, when relative motion between driving and driven members tends to take place.

1.1.2.2 CENTRIFUGAL CLUTCH

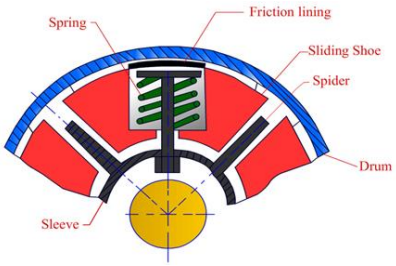

Fig -2: CENTRIFUGAL CLUTCH

The centrifugal clutches are usually incorporated into motor pulleys. It consists of a number of shoes on the inside of a rim of the pulley, as shown in figure.

The outer surface of the shoes is covered up with a frictional material. These shoes which can move radially in the guides and they are held on the driving shaft by means of springs against the boss (or spider).The springs exert a radially inward force which is assumed constant. When the mass of shoe is revolving, and causes it to exert a radially outward force i.e. centrifugal force. The magnitude of centrifugal force mainly depends upon the speed at which the shoe is revolving. A little consideration will show that when the spring force is greater than the centrifugal force, the shoe remains in the same position as when the driving shaft is stationary, The shoe is just floating when the spring force is equal to the centrifugal force. When the centrifugal force increase more than the spring force, then the shoe moves outward and comes into contact with the driven member and presses against driven member. Due to the difference of the centrifugal force and the spring force the shoe presses against the driven member. The increase in speed causes the shoe to press harder and enables more torque to be transmitted.

2. PROBLEM DEFINITON

Imagine the vehicle with conventional transmission system and manual five speed gearbox, when required to be moved from stationary condition to the top gear the driver will have to perform in all thirteen operations.

The operations are first disengagement of clutch, shifting the gear, then reengagement of clutch, thus three operations per gear, in all fifteen operations , the first and last operation being common in cycle of operations, hence total thirteen operations are required to be performed. This becomes an extremely tiresome activity in dense traffic areas. It is important to note that majority of the operations performed are cutch related.

Hence the need of a semi-automatic or automatic transmission system that makes the driving of vehicle easier without many hassles.

4. SOLUTION- NEWTON AUTOMATIC CENTRIFUGAL CLUTCH

4.1 Principle or Operation Of Newton Automatic Centrifugal Clutch

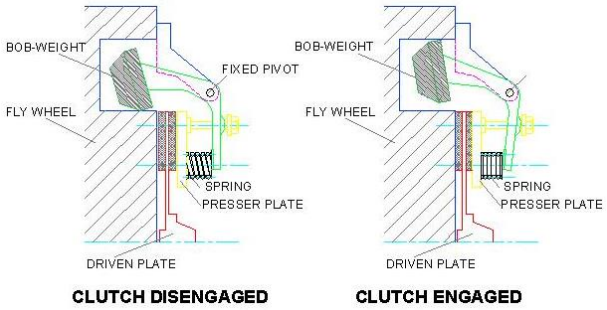

Fig -3: Principle of Newton Automatic Centrifugal Clutch

The Newton automatic centrifugal clutch employs only one set of compression springs instead of the usual two sets, with this arrangement it is possible to reduce the weights of the centrifugal members.

When the engine is running at idling speed and the clutch is not engaged the hinged bob-weights are rest in the lower or inward sides of holes of the flywheel. When the engine is accelerated above 700 to 800 rpm , the weights fly outwards and in doing so their lever ends compress the springs as shown in (fig 2(B)), so as to engage the clutch plates. When the full engagement pressure between the clutch members has been attained any further increase in engine speed brings the bob weights against the outsides of the flywheel holes, thus limiting the pressure plate action.

4.2 Construction & Working of Newton Automatic Centrifugal Clutch

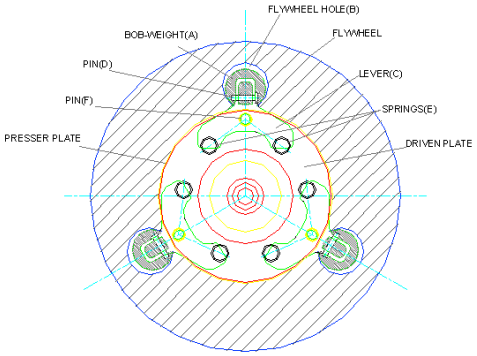

Fig-4: Outside End View Of Newton Automatic Centrifugal Clutch

Fig. shows the Newton clutch in the outside end view. It will be seen that three of these bob weights (A) are used in the three flywheel holes(B) . These weights are carried by levers(C) which can rock on the pins mounted on the axis shown at (D). The ends of these levers engage the driving springs at the points (E). Situated between (E) & (D) is a fulcrum lever. A pin (F) , carried by the pressure plate , carries a nut and washer which works over the fulcrum. It will be seen that spring load at
(E), resisted by (F) operating around (D) will move weights against the inner stops thus releasing the pressure plate ; when the engine is stationary or idling. As the engine accelerates (A) is thrown out , revolving around (D) and loading up (E) against the pressure plate until the plate contacts the driven plate which then takes the load and relieves this load at fulcrum (F). The clutch withdrawal levers are of orthodox design so that when clutch is operating at speeds above its centrifugal engagement speed the clutch can be disengaged or reengaged for gear changing purpose as in normal hand gear change practice.
For automatic gear changing use is made of servo device to perform clutch operations involved in gear changing.

5 FRICTION DISK FACING MATERIALS

5.1 Requirements of Good Friction Material.

1. Good wearing properties:- The wear of facing depends upon the rubbing speed and intensity of pressure and it should not exceed 30m/sec and 100kpa respectively.
2. Presence of good binder in it.
3. It is Cheap and easy to manufacture.
4. It has high co-efficient of friction.
5. It is having high resistance to heat.

6. CONCLUSIONS

From the above discussion it is clear that automatic clutch with features similar to single plate clutch that gives the maximum power to weight ratio in all clutch categories, as well automatic function as that of the centrifugal clutch which gives ease of operation

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