Automatic Transmission Vehicle Using Infinitely Variable Transmission

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Abstract—In conventional transmission system generally use of friction clutch and gear box. It required hydraulic fluid and costly lubrication as well as cooling method's resulting higher operating cost and more power losses, by eliminating the gear box and clutch from the automobile system, it makes transmission system automatic.

The drive use in transmission system is lestran drive. It is also known as infinitely variable transmission. It produce eccentricity between lobe which is turned transmit the power to yoke and from yoke the power is transmitted to unidirectional clutch to the final drive. An Infinitely variable transmission provides continuously variable speed and torque ratios, depending on the input and output speeds. The drive gives variation in torque and motion from zero to infinity and also increases transmission efficiency. The small no of parts and the state forward parts design drive reduces manufacturing cost in both material and labor and also increases reliability. The advantages using the drive are by eliminating the gear box and friction clutch, reduces the driving stresses and also increases the efficiency of drive considerably.

Keywords—Mass Inertia drive, Infinitely Variable Transmission, Automatic Transmission, IVT.

I. INTRODUCTION

The mass inertia drive system is the innovative concept of Infinitely Variable Transmission (IVT) and it is very efficient than the conventional transmission system. The conventional transmission uses single plate friction clutch and Gearbox. This system having efficiency less than 70% while using the infinitely variable transmission system in the automobile gives efficiency up to 96%. When in system uses the CVT then efficiency in between 60%-80%.

Hence IVT can be used in any application such as Heavy truck, Main battle tanks or Earth movers etc.

II. OBJECTIVE

The objective of the using the IVT instead of conventional system are as follows,

1. Eliminate friction clutch from the system.
2. Make transmission automatic by automatically selecting gear ratios.
3. Increase transmission efficiency
4. Reduce system weight and space occupied.

III. WORKING PRINCIPLE

The main aim is to eliminate the conventional gearbox and clutch. The IVT uses to obtain automatic transmission in automobile. It works on the principle of mass-moment of rotation and centrifugal action. The following figure shows the mass rotation moment.

![Fig. 1 - Mass Rotation Moment](image)

In stage 1, the centrifugal forces generated by the rotating masses pass through the point of rotation and therefore do not generate any moment. In stage 2, the masses have continued to rotate, and now the centrifugal forces generate a clockwise torque. In Stage 3 shows the masses having continued to rotate to the point where their centrifugal forces once again pass through the point of rotation, and cause no moment. Finally, in stage 4 the masses have rotated so that their forces now generate a counter-clockwise torque. The maximum torque is given by the formula:

\[ T = m\omega^2R_{CG} \]

Again in actually the working is done as shown in figure 2.
Fig. 2 - Mass Profile with Key Features

The figure 2 shows the mass which is having bore to fix bearing in that.

Inside the race of bearing the lobe is fixed. The lobe is also having bore which eccentric for the fixing of the shaft. Due to eccentric nature of the shaft mounted in the hole of lobe the moments get easily. The figure 2 shows the eccentric distance and due to this the moment of rotation get. Hence, when rotation of the mass will get centrifugal action and rotate the output shaft.

IV. CONCEPT OF MASS INERTIA DRIVE

The IVT drive having the masses which interact with arm assembly. This masses and arm assembly allow generating the torque by centrifugal action of the mass rotation into the output shaft. In the assembly of IVT having three lobes on the output shaft. On that lobe the masses are fixed by means of the bearing. The assembly is done by the press fitting. The lobes are 180 degree to the opposite lobe. The middle lobe having mass greater than other two lobe. Which having the magnitude middle lobe mass is equal to other two lobes.

The configuration is ensures that the shaft is balanced the two masses on one side of the shaft equal the mass of the largest mass on the opposite side of the shaft.

Figure 3 shows the construction of the IVT. When the masses rotate around the lobe, the centrifugal forces that generate moment about the arm assembly shaft. In this case, the yoke will cause the masses to rotate about the lobes, and the masses in turn will generate moments, the direction of which will depend on what stage of rotation the mass is in.

The mass inertia drive can be considered to consist of four main parts. These are the input assembly, arm assembly, clutch assembly and the output shaft. The input assembly delivers the input from the engine, the arm assembly generates oscillating torque, the clutch assembly rectifies that oscillating torque to a consistent direction, and the output shaft delivers the output to the rest of the drive train. This assembly and its function are as shown in the figure 4.
The mass inertia drive will receive input from the prime mover through the use of spur gear pair between the prime mover shaft and the input shaft of the mass-inertia drive. This input shaft will transmit the torque to a Yoke, which has two pins projecting from it. The yoke pins connecting to links, which are in turn pin-connected three masses. These masses are attached as will to the arm assembly.

V. RESULTS

When the IVT uses in any automobile get the following results

A. Arm Assembly Output vs. Time

The IVT in turn converts the constant input into a sinusoidal, oscillating torque via its specific mechanism, described in the following subsection. Fig. 5 Arm Assembly Output shows the behaviour of the oscillating torque developed.

B. IVT Output vs. rpm

Ideally, the prime mover will operate at its optimum speed for either power, torque efficiency. The resulting oscillations and pulses will be of sufficiently high frequency to produce an output that will observe essentially consistent rotational motion.

REFERENCES