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Review of Experimental Analysis of IVT for Light Weight Vehicle by Using Three Different Masses

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Abstract: In this paper, the Infinitely Variable Transmission in use particular drive a mounted an auxiliary motion in equal number of masses. The variation of transmission in different masses. The IVT has number of identical an unit ,each unit contain tree dimensional yoke , cam follower, pulley wheel, one way clutch and drive motor, though each unit rotational motion is converted in an oscillatory linear motion of variable amplitude and rectified to the rotation motion again. The maximum speed with increases s transmission ratio to the system depends on geometric design factors. This paper reviews the transmission system with a concept proposal for Infinitely Variable transmission
.

Keywords: Infinitely Variable Transmission, Positive Drive, CVT.

I. INTRODUCTION

The purpose of this design project was to improve upon an existing Infinitely Variable Transmission (IVT) design for use in light duty vehicle .An IVT is a new design of transmission which utilizes moments produced by rotating offset masses to transfer torque, while varying output speed, from the engine to the output shaft. In an effort to design a reliable and efficient IVT, all components from the existing IVT were analysed in detail and modified accordingly.

The IVT is solving the problem in modern automobile industry to develop new generation in vehicle to sustain. The input speed and output speed will be different by using masses profile and infinity check the depending upon various load condition in plate, yoke, clutch (Three masses.) The superior in automobile torque cycle, the linear IVT dissolve input traction to the shaft traction to the output shaft to the transmission solver transmission ratio. The different investigators presents the background and theory related to the IVT, considers alternative designs, and presents the final design. It also outlines improvements for the IVT which will be installed in automobiles.

A Three masses-based Infinitely Variable Transmission system allows a user to vary the speed between input & output progressively from one positive value to another. Unlike, conventional transmissions the selection of gears is not restricted to a finite number of ratios. The Three masses-based Infinitely Variable Transmission systems can be used in automobile drive applications to improve performance, economy & functionality

II. OBJECTIVES OF RESEARCH

a) Development of kinematic linkage model for kinematic synthesis of transmission motion
b) Design and development of Infinitely Variable transmission based on skeleton developed using CAD overlay method
c) Manufacturing of IVT to derive the for Neutral position along with torque and power augmentation with increase in input speed.

III. NEED OF INFINITELY VARIABLE TRANSMISSION SYSTEM

There are many automobile and mechanical units that under varying circumstances make it desirable to be able to drive at an barely perceptible speed, an inter mediate speed or a high speed. Thus an infinitely variable (or step less speed variation) in which it is possible to get any desirable speed. Some mechanicals hydraulic and electrical devices serve as such step less drives. However the torque Vs speed characteristics of these drives do not match that of step less drives at increased driving torque at low speeds. Hence the need of a step less drive with the following characteristics Step less or infinitely variable speed.

- Wide range of speed variation i.e. (Nmax to Nmin).

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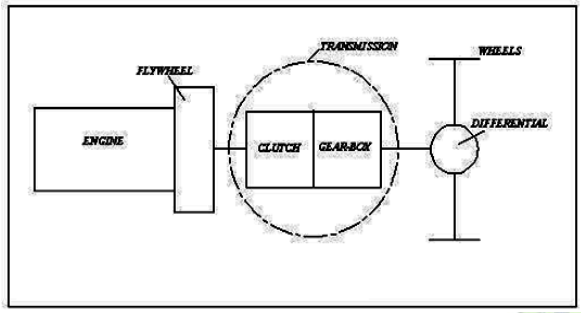
- Shifting form one speed to another should be shock less.



- Minimum no of controls for speed changing.
- Ease of operation.

Figure 1. Conventional Automobile transmissions System

IV. LITERATURE REVIEW ON IVT:

Konstantin Ivanovo (2013) Presented paper on A CAD Design of a New Planetary Gear Transmission [1]. This paper presents the design and characterization of a new planetary gear transmission with two degrees of freedom. The main purpose of the planetary gear transmission is on the capability to adapt the operation to variable loading. Designed adaptation provides a motion of output link with a speed that is inversely proportional a loading of the link. A detailed 3D CAD model has been proposed in order to investigate the operation feasibility of the proposed design solution.

Giuseppe Carbone (2009) The Dissertation Presented on Modelling, Optimization and verification of power split infinitely variable transmissions [2]. This Dissertation presents the author presents an optimization procedure to design infinitely variable transmission architectures which allows them to achieve a significant reduction of power recirculation and, hence, an increase in mechanical efficiency. The focus of this thesis is on infinitely variable transmissions used in off-highway vehicles and in particular on input coupled and output coupled architectures. The optimized solutions have been analysed in depth, with particular attention to the power flowing through the infinitely variable unit, which strongly influences the overall efficiency of the transmission. The major result of this study is that also the so far neglected output coupled solution, if properly optimized, guarantees very good performance over the entire range of vehicle speed. The analysis then shows that the particular choice of either input or output coupled architecture by itself, or of a mixed solution, strictly depends on the specific application under consideration and that none of them should be discarded a priori.

Peter Eichenberger (1988) Presented Patent on Dual Range Infinitely Variable Transmission [3]. In this patent improving torque transmitting capacity has worked which having a driving sheave assembly connected to the crankshaft of an internal combustion engine and coaxially mounted with respect to the crankshaft, an intermediate shaft upon which is mounted a driven pulley assembly, a drive chain or belt drivable connected the pulley assemblies, high range and low range gearing coaxially disposed with respect to the driven pulley assembly, a countershaft arranged in parallel and spaced disposition with respect to the secondary shaft wherein the countershaft is adapted to support forward and reverse gearing and improved bearing means for supporting the countershaft and wherein a differential output assembly connects torque output elements of the countershaft to each of two axle half shafts thus providing improved torque transmitting capacity with reduced overall dimensions due to the reduced shaft spacing.

Wayne Paul Bishop (2011) Presented Patent on Positive Drive Infinitely Variable Transmission [4]. In this patent Infinitely Variable Transmission by using Forced Way method. This is a unique method of generating variable ratio outputs from a given input of constant rotational speed by forcing one end of a drive shaft to follow a continuous path (way) around a given circle at a constant speed that can then be deformed into curves of varying radiuses that would range from the radius of the given circle to that of the various radiuses (arcs) of various ovals to a final shape of an oblong. Forcing the end of the drive shaft to follow these shapes would result in the driveshaft rotating at different rotational speeds as it transverses the shape. By sampling only the rotational output while moving over the desired portion of the shape one can control the outputs rotational speed which will be some ratio of the input.

Derek F. Lahr (2006) Presented paper on the Operation And Kinematic Analysis Of A Novel Cam-Based Infinitely Variable Transmission [5]. In this paper present the operation and analysis of a novel, highly configurable, infinitely variable transmission of the

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ratcheting drive type is presented. This particular drive uses a cam and a number of cam followers rotatable mounted to a carrier plate to generate an oscillatory motion in an equal number of planet gears. A number of indexing clutches are then used to rectify this motion into a rotational output. A full description of the mechanism, including its components, operation, and kinematic equations are presented. There are a number of inversions of this device, and their characteristics and limitations are discussed. In addition, a method is presented to select the most suitable inversion, gearing, and follower velocity for a given application.

Ranbir Singh (2012) Presented paper on a brief review of transmission in automobiles [6]. In this paper the need for a transmission in an automobile is a consequence of the characteristics of the internal combustion engine. Engines typically operate over a range of 600 to about 7000 revolutions per minute (though this varies, and is typically less for diesel engines), while the automobile vehicle wheels rotate between 0 rpm and around 1800 rpm. Furthermore, the engine provides its highest torque outputs approximately in the middle of its range, while often the greatest torque is required when the vehicle is moving from rest or travelling slowly. Therefore, a system that transforms the engine's output so that it can supply high torque at low speeds, but also operate at highway speeds with the motor still operating within its limits, is required.

Douglas Magyari (1999) Presented Patent on Infinitely Variable Transmission [6]. In this patent the same vein as other ratcheting drives, develop an Infinitely Variable Transmission comprising a pair of rotary, generally conical, torque-transmitting members, each being mounted for rotation on its geometric axis, the angularity of axes, one with respect to the other, being variable, the outer surfaces of each member having torque transmitting needles extending outwardly from the generally conical surface, the needles of one member meshing with the needles of its companion member, the needles being capable of flexing whereby torque may be transmitted through the rotary members without frictional sliding motion at the area of meshing engagement of the needles, the angularity of one member with respect to the other permitting a wide torque transmitting ratio range

Giuseppe Carbone (2009) The Dissertation Presented on Modelling, Optimization and verification of power split infinitely variable transmissions [8]. This Dissertation presents the author presents an optimization procedure to design infinitely variable transmission architectures which allows them to achieve a significant reduction of power recirculation and, hence, an increase in mechanical efficiency. The focus of this thesis is on infinitely variable transmissions used in off-highway vehicles and in particular on input coupled and output coupled architectures. The optimized solutions have been analysed in depth, with particular attention to the power flowing through the infinitely variable unit, which strongly influences the overall efficiency of the transmission. The major result of this study is that also the so far neglected output coupled solution, if properly optimized, guarantees very good performance over the entire range of vehicle speed. The analysis then shows that the particular choice of either input or output coupled architecture by itself, or of a mixed solution, strictly depends on the specific application under consideration and that none of them should be discarded a priori.

V. THEORETICAL CONSTRUCTION AND WORKING OF IVT:

The input to the Mechanical Torque Convertor, the motor, produces a power and torque output that is constant with respect to time, at a given speed. This constant power and torque, is transmitted to the arm assembly via the input assembly. The IVT in turn converts the constant input into a sinusoidal, oscillating torque via its specific mechanism; the clutch assembly of the mass-inertia drive converts the oscillating power output from the arm assembly into unidirectional power pulses. The average power is dependent on the amplitude and frequency of these pulses. Higher amplitude and frequency will result in a higher average power output. The amplitude of the power pulses depends on the magnitude of the input received from the engine, while the frequency of the pulses is dependent on the speed of the arm assembly shaft.

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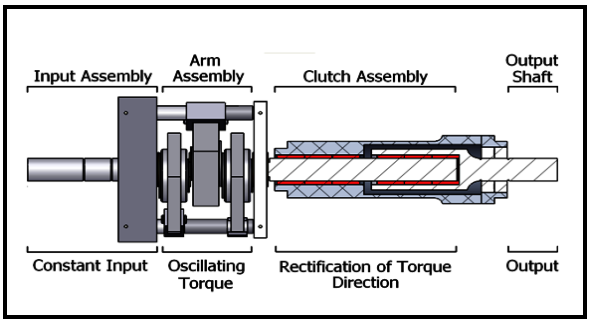
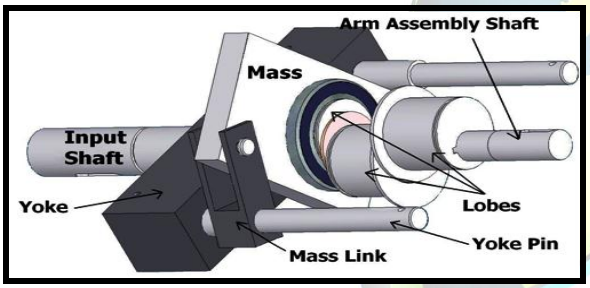


The Mechanical Torque Convertor can be considered to consist of four main parts. These are the input assembly, arm assembly, clutch assembly and the output shaft. All of these areas serve a specific purpose in the operation of the mass-inertia drive. The input assembly delivers the input from the engine.



The heart of the mass-inertia drive is the method in which the masses interact with the arm assembly. This arm assembly allows for the masses to generate torque through their rotation and transmits it to the output shaft. The central shaft of the arm assembly has three lobes attached to it. These lobes are circular pieces of steel with an offset bore for the arm assembly shaft The offset shaft means that any force acting radically on the lobe is translated into a moment which acts on the shaft. This is because the centre of the shaft is offset from the centre of the lobe, creating a moment arm. The arm assembly shaft is fitted with three lobes; one is offset 180o opposite of the other two lobes and each with a bearing press-fit onto it. The centre lobe is fitted with the largest of the three masses, while the outer two lobes are each fitted with a mass half the size of the largest mass.

The maximum torque is given by the formula:

$$T=m*\omega 2*RCG*D \qquad (1)$$

These four stages demonstrate the oscillatory nature of the torque generated by the mass-inertia drive, This configuration 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.

VI. CONCLUSION

The IVT is infinity variable transmission of input speed to the output speed in torque convert ratio will be change. In three masses like Rectangular shape, irregular shape, the input shaft given the specific speed motor to the output result is varying different masses to speed difference ratios are design criteria of IVT and the speed. The proposed method is confirmed by comparing it and experimental. The proposed method is found to be simple and accurate. The IVT is newly concept in Light and Medium vehicle. The transmission ratio will be change in structures. Further development of masses. Transmission ratio. In any technology with inherent benefits eventually reach fruition the IVT has only just begun to blossom.

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