FABRICATION OF FOUR WHEEL DRIVE

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ABSTRACT

A power transmission system for a four-wheel drive vehicle comprises a power transmission mechanism provided in a vehicle arranged such that power is always transmitted to one of two pairs of wheels consisting of a pair of front wheels and a pair of rear wheels, to transmit power to the other pair of wheels, and a differential gear unit arranged between left and right wheels in the other pair, to distribute the power transmitted from the power transmission mechanism to the other pair, between the left and right wheels. The differential gear unit is a torque-sensitive differential gear unit with a differential limiting function for producing a differential limiting force between the left and right wheels, depending on power transmitted thereto, and a power transmission control means controls the power transmitted from the power transmission mechanism to the differential gear unit according to a driving state of the vehicle.

KEYWORDS: Power transmission, Differential, gear box, axle.

INTRODUCTION

A power transmission system for a four-wheel drive vehicle comprises a power transmission mechanism provided in a vehicle arranged such that power is always transmitted to one of two pairs of wheels consisting of a pair of front wheels and a pair of rear wheels, to transmit power to the other pair of wheels, and a differential gear unit arranged between left and right wheels in the other pair, to distribute the power transmitted from the power transmission mechanism to the other pair, between the left and right wheels. The differential gear unit is a torque-sensitive differential gear unit with a differential limiting function for producing a differential limiting force between the left and right wheels, depending on power transmitted there too.
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vehicle.

There are many different varieties of four wheel drive vehicle, so it’s important to
understand how to make the most of each system before embarking on an off-road journey.
The three main varieties of four-wheel drive system are:
1. Manually Full time four wheel drive
2. selectable four wheel drive
3. Automatically selected four wheel drive

This project explain how of these three systems work, and how to use them in the most
effective way when driving off-road or in challenging condition.

FOUR WHEEL DRIVE COMPONENTS
Main Parts of four wheel drive system is As mentioned Below:
- Chassis
- Gearbox
- Universal joint
- Differential

Explanation of Parts is as mentioned below:

Chassis:
Chassis is essential Part of Four Wheel Drive System . Chasis Design is Based on Different
Stress Applied During The Driving The vehicle
Loads due to normal running conditions: Vehicle transverse on uneven ground. Manoeuver
performed by driver.
Five basic load cases:
- Bending case
- Torsion case
- Combined bending
- torsion Lateral loading
- Fore and aft loading

GEAR BOX
Gearbox is enclosed system of assembled gears that transmits mechanical energy from a
prime mover to an output device. A gearbox can also change the speed, direction, or torque of
mechanical energy. Gear box is a device placed between the clutch and propeller shaft. It
allows the engine to run at different speeds relative to road vehicles, so as to maintain its
power and regulates the torque. The vehicle requires high torque when climbing hills and
when starting, even though they are performed at low speeds .On the other hand, when the
vehicles are running at high speeds on the road level, high torque is not required because of
momentum.
PURPOSE OF GEAR BOX
An automobile is able to provide varying speed and torque through its gear box. Various functions of a gear box are listed below To provide high torque at the time of starting, vehicle acceleration, climbing. To provide more forward speeds by providing more than one gear ratios. In modern cars, four to five forward gears and reverse gear is provided. For given engine speed, higher speed can be obtained by running in higher (4th and 5th) gears. To provide a reverse gear for driving the vehicle in reverse direction and To give different speeds and torques. To get high acceleration from rest .To drive vehicle at low speeds. In the engine running conditions the vehicle can be stopped by changing the gear to neutral condition without applying brake.

![Figure-1 Gear Box](image1)

UNIVERSAL JOINT:
An automotive drivetrain is an assembly of one or more driveshaft, universal joint, and slip joint that forms the connection between the transmission and the drive axle. The function of drivetrain is that it allows the driver to control the power flow, speed and multiple the engine’s torque. A universal joint (U-joint) is a joint in a rigid rod that permits the rod to move up and down while spinning in order to transmit power by changing the angle between the transmission output shaft and the driveshaft as shown in Figure1. The most common types of U-joint used in automotive industry is Hooke or Cardan joint (Birch and Rockwood, 2005). A basic U-joint consists of driving yoke, driven yoke, spider and trunnions. Each connection part of the spider and trunnion are assembled in needle bearing together with the two yokes. The driving yoke force the spider to rotate the other two trunnions. The previous action causes the driven yoke to rotate.

A universal joint is used where two shafts are connected at an angle to transmit torque. In the transmission system of a motor vehicle, the transmission main shaft, propeller shaft and the differential pinion shaft are not in one line, and hence the connection between them is made by the universal coupling.

DIFFERENTIAL
A differential is a device, usually but not necessarily employing gears, capable of transmitting torque and rotation through three shafts, almost always used in one of two ways: in one way, it receives one input and provides two outputs—this is found in most automobiles-
-and in the other way, it combines two inputs to create an output that is the sum, difference, or average, of the inputs. In automobiles and other wheeled vehicles, the differential allows each of the driving road wheels to rotate at different speeds, while for most vehicles supplying equal torque to each of them.

PURPOSE OF DIFFERENTIAL

A vehicle's wheels rotate at different speeds, mainly when turning corners. The differential is designed to drive a pair of wheels with equal torque while allowing them to rotate at different speeds. In vehicles without a differential, such as karts, both driving wheels are forced to rotate at the same speed, usually on a common axle driven by a simple chain-drive mechanism. When cornering, the inner wheel needs to travel a shorter distance than the outer wheel, so with no differential, the result is the inner wheel spinning and/or the outer wheel dragging, and this results in difficult and unpredictable handling, damage to tires and roads, and strain on (or possible failure of) the entire drivetrain.

FUNCTION OF DIFFERENTIAL

The following description of a differential applies to a "traditional" rear-wheel-drive car or truck with an "open" or limited slip differential: Torque is supplied from the engine, via the transmission, to a drive shaft (British term: propeller shaft', commonly and informally abbreviated to prop-shaft), which runs to the final drive unit and contains the differential. A spiral bevel pinion gear takes its drive from the end of the propeller shaft, and is encased within the housing of the final drive unit. This meshes with the large spiral bevel ring gear, known as the crown wheel.

The crown wheel and pinion may mesh in hypoid orientation, not shown. The crown wheel gear is attached to the differential carrier or cage, which contains the 'sun' and 'planet' wheels or gears, which are a cluster of four opposed bevel gears in perpendicular plane, so each bevel gear meshes with two neighbours, and rotates counter to the third, that it faces and does not mesh with. The two sun wheel gears are aligned on the same axis as the crown wheel gear, and drive the axle half shafts connected to the vehicle's driven wheels. The other two planet gears are aligned on a perpendicular axis which changes orientation with the ring gear's rotation.
In the two figures shown above, only one planet gear (green) is illustrated, however, most automotive applications contain two opposing planet gears. Other differential designs employ different numbers of planet gears, depending on durability requirements. As the differential carrier rotates, the changing axis orientation of the planet gears imparts the motion of the ring gear to the motion of the sun gears by pushing on them rather than turning against them (that is, the same teeth stay in the same mesh or contact position), but because the planet gears are not restricted from turning against each other, within that motion, the sun gears can counter-rotate relative to the ring gear and to each other under the same force (in which case the same teeth do not stay in contact).

Thus, for example, if the car is making a turn to the right, the main crown wheel may make 10 full rotations. During that time, the left wheel will make more rotations because it has further to travel, and the right wheel will make fewer rotations as it has less distance to travel.

ADVANTAGES AND DISADVANTAGES OF FOUR WHEEL DRIVE

All-Wheel Drive (or AWD) is a system in which all four wheels of a car operate simultaneously to improve traction and handling. While it is possible for a car to have continuous AWD capabilities, it is far more common for one pair of wheels to engage only when sensors detect that the other pair has begun to slip. There are both advantages and disadvantages to AWD systems.

Traction - In intermittent AWD systems, the rear wheels engage when sensors detect slippage from the front wheels. Under these circumstances, the vehicle effectively detects and compensates for dangerous driving conditions such as standing water, snow, ice or gravel that could otherwise compromise control of the vehicle. By engaging the second set of wheels, the vehicle experiences two additional points of contact on the surface of the road, allowing greater likelihood that its tires will grip the surface and allow the driver to retain control. The additional weight of AWD systems also encourages more grip on the road and the added points of contact distribute the vehicle's weight more evenly over points of propulsion.

Fuel Efficiency - The primary disadvantage of an AWD vehicle is its cost. The drive train and related equipment necessary to provide both continuous and intermittent AWD is complex and expensive, often requiring sensors and computers that are not necessary on two-wheel-drive vehicles. This cost increases the initial market value of the vehicle and can also affect the cost of repairs. In addition to these costs, AWD systems require more fuel to power the additional wheels and are less fuel efficient than comparable two-wheel-drive vehicles.

Breaking Distance & collision Avoidance - While the weight of AWD vehicles improves their handling, it also increases the distance they require to stop. In a scenario where the vehicle must make a sudden stop and cannot swerve or turn, a collision becomes more likely than with a lighter car. Under similar circumstance, but ones in which an accident can be avoided by turning; AWD vehicles offer superior collision avoidance than similar vehicles with less effective handling and turning capabilities.
CONCLUSION
By studying all these we can conclude that the Four wheel Drive system is necessary for the modern cars. We can easily Ride 4wd system vehicle on road with more safely It provide good handling to the driver give better comfort and make him less fatigue.

REFERENCE
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