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Design and Optimization of Thompson CV Joints in Axle

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Abstract

In direct mechanical drive system, coupling of various driven elements is required. Majority of drive elements including gear reducers, lead screws and host of other components are driven by shaft that is supported by several bearings. Owing to the rigidity of the couple, a driving shaft is slightly misaligned. The power transmission relation purpose is to transfer torque from the driving shaft to the tubing, along with misalignment of the shaft. Misalignment in the shaft can contribute to unnecessary wear stresses on the shaft bearings. For misalignment problems, including Oldham's coupling and universal joint, with many drawbacks, few traditional solutions are available. Thompson's constant velocity (CV) coupling can solve these drawbacks and includes features such as minimizing side loads, increased misalignment, more running speeds, better transmission performance and much more. This paper explores the nature and optimization of constant velocity joints. This paper summarizes the research work of many scholars on transmission relations and constant speed joints.

Keywords: *Design, Optimization, Thompson CV joint, Transmission Coupling, Mechanical components.*

I. INTRODUCTION

The basic purpose of a power transmission link is to transfer a torque at defined shaft speed, including a shaft misalignment, from the input/driving shaft to an output/driven shaft. Shaft malalignment is a symptom of several causes, including installation defects and differences in resistance. The axial and radial forces exerted on the relation will increase misalignment. Unwanted side loads are commonly introduced by the coupling in misaligned shaft applications. These side cargos are induced by flexing or compressing cup elements, by dynamic coupling action, frictional loading and charges. The first and only constant velocity joint in the world is the Thompson connector:

1. Has all roller bearing loads
2. May not have any surfaces slipping or skipping
3. Can endure deterioration of axial and radial loads
4. No torque cap, designed at every torque stage
5. No special lubrication is required.
6. Don't have to boot dust
7. No components wear except for substituted rollers and trunnages
8. Suitable for the application of car tail or hose pipe.
9. Is a real CV connection as different from a CV connection
10. Is less cumbersome than a double cardan or joint.

The Thompson Coupling is literally two coaxially assembled cardan joints, where cross-cutting equivalents of each are bound together by trunnions and rollers, which are constrained to lie constantly on the homocentric level of the joint. The limiting means restricting such trunnions and coils consists of a spherical four-bar attachment, which is two segments, or a spherical draglink. A trunnion is fixed to the input shaft at the end and the second end of the draglink at the inside of the jack of the output shaft is mounted to a removable pin that forms a trunnion. A large circular ark centred on the axis of the joint constantly forms each arm or bar of the jig. The central axis of the Draglink lies on a trunnion in the centre of the "C" member; on the extensive trunnions which connect the two joints of the Cardan are the ends of the "C" member. Through action of the joint, the central axis of the draglink and thus the trunnion in the "C" member, the included acute angle continually divides between the expanded inlet and outlet axis and thus continually lies on the axis of the homokinetic joint plane. As is well known, structurally excellent four bar attachment structures remain spherical. The coupling components remain aligned along the three rotating axes, namely the input shaft axis, the output shaft axis and the homokinetic plane axis [1].

Every part of the Thompson can be manufactured by forging and/or casting in mass manufacturing, with the only other demand being the drilling and machinery of the bearing magazines, trousers and circular grooves. There is no dedicated equipment and no sophisticated workmanship at all. Bearings are stock and installation is very simple for most applications [2]. As car engine efficiency improves, complete power transmission coupling for constant speed joints is needed
Constant velocity joint used, like Thompson. The key characteristics of the Thompson CV connector are that side loads are minimised or even removed, Failure of shaft and better drive precision. The Thompson Constant speed joint is an optimal solution for the power transfer between the two. The only sections that sport the parasitary bearing joints were shafts at an angle

of 30 grade to 65 grades. The constant Thompson speed joint makes sure no Swinging loads are transmitted to the output shaft [3].

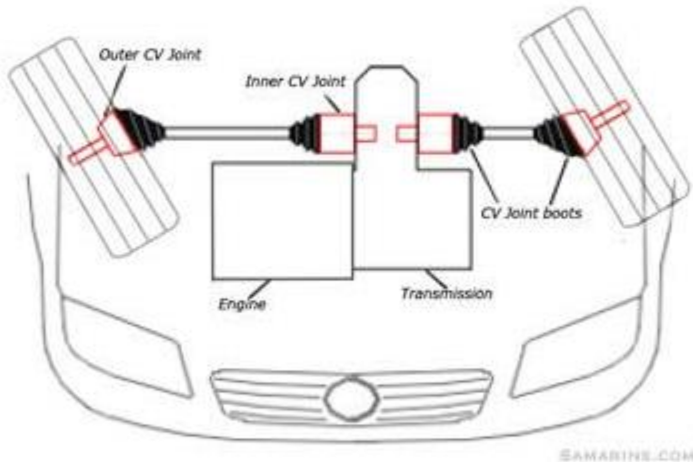

Fig. 1 CV joints in 4-wheelers [4]

Both front-wheel drive vehicles have Constant Velocity joints or CV joints on both ends of the drive shafts (half shafts) (half shafts). The internal CV connects the transmission with the drive shafts, and the external CV connects the drive shafts with the wheels. There are also CV joints for certain rear and four-wheel drive cars and for trucks (figure 1). The CV joints are required for the torque to be transmitted continuously from the drive wheels when adapting the up and down movement of the suspension. CV joints provide the torque in the front wheels during twists with the front wheels. Two types of CV joints are most common: one ball and the other tripod. On the outside of the drive shafts (outer CV joints) the ball-type CV joints are used by the front wheel drive cars while the tripod-type CV joints[5] are used more on the inside.

A. **Advantages: -**

1. Reduced friction, heat, wear, collateral damage and vibration
2. Continuous full load operation at high shaft output angles
3. Reduced loss of energy
4. Enables modern designs with higher output angles to the shaft
5. Plays at room temperature – long life

II. LITERATURE REVIEW

A real constant-speed joint without sliding surfaces at load bearing, working at 20° angles with special frameworks up to 45°. The Thompson Constant Velocity Link (TCVJ) transmits a drive through an angled joint of driving and driven shafts with a true one-to-one relationship among the shafts [6]. Constant Thompson speed joint is used as a solution to the shortcomings of traditional transmission solutions over misaligned shafts. There are other constant speed joints besides the Thompson constant speed joint [7].

III. DISCUSSION

A real constant-speed joint without sliding surfaces at load bearing, working at 20° angles with special frameworks up to 45°. The Thompson Constant Velocity Link (TCVJ) transmits a drive through an angled joint of driving and driven shafts with a true one-to-one relationship among the shafts. The TCVJ has all tackled and solved the conventional problems of driving power around a curve of heat, friction, power loss and shaft speeds inherent in universal joint technology. The TCVJ with its related sliding shaft at near ambient temperatures without any intrinsic vibrational effects in its architecture actually decreases vibrational inputs from gears, reduced units and motors so that the life of the machine is safeguarded and extended. The TCVJ was born out of a re-understanding of the vectors in the spinning shafts and directional adjustments with no weight-bearing sliding components.

IV. RESULT AND CONCLUSION

The efficiency is dependent on the efficiency of the transmission system, because transmission is a very essential part of any mechanical power system. The most important aspect that determines the efficiency of the transmission system is a transmission link and thus a thorough analysis of the transmission connection is required for coupling without failure. Constant Thompson speed joint is used as a solution to the shortcomings of traditional transmission solutions over misaligned shafts. There are other constant speed joints besides the Thompson constant speed joint. Optimizing constant velocity coupling of Thompson will definitely provide the data for further transmission studies. TCVJ also provides advice on optimization for further investigation and applicability of constant velocity joints.

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