International Journal of Research in Engineering and Science (IJRES)
ISSN (Online): 2320-9364, ISSN (Print): 2320-9356
www.ijres.org Volume 2 Issue 5 ǁ May. 2014 ǁ PP.50-53

WAVE GEAR

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ABSTRACT:- Wave gear drives have been widely used in many industrial fields. It is a popular choice for many automation applications because of its superior power transmission qualities, which include zero backlash, high torsional stiffness, high positional accuracy, and torque to weight ratios.
Key words:- Flex spline, Wave generator , Positional accuracy , Zero backlash

I. Introduction

A gear is a rotating machine part having cut teeth, or cogs, which mesh with another toothed part in order to transmit torque.

Automation equipment is constantly seeking increased throughput-it's a never ending requirement. Wave Gearing (also known as are strain wave gears) is a special type of mechanical gear system that can improve certain characteristics compared to traditional gearing systems (such as Helical Gears or Planetary Gears)

II Wave gear drive

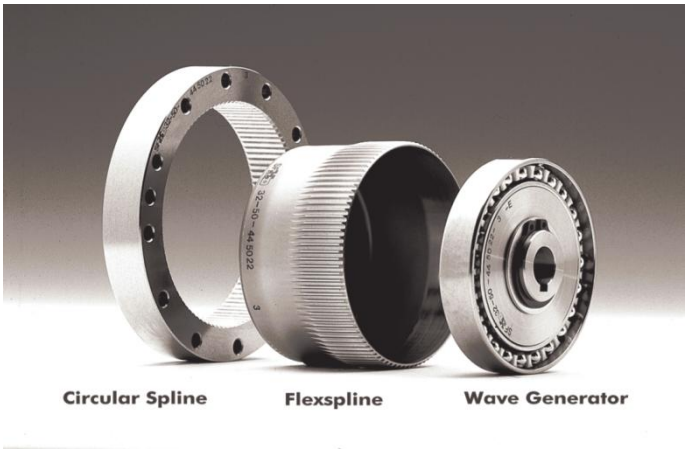

Fig.1 Components

The **wave generator** is made up of two separate parts: an elliptical disk called a wave generator plug and an outer ball bearing.

The **flex spline** is like a shallow cup. The flex spline fits tightly over the wave generator, so that when the wave generator plug is rotated, the flex spline deforms to the shape of a rotating ellipse but does not rotate with the wave generator.

The **circular spline** is a rigid circular ring with teeth on the inside. The flex spline and wave generator are placed inside the circular spline, meshing the teeth of the flex spline and the circular spline.

III Drive principle

When wave generator is driving, cam runs inside the flex spline, and make flex spline and shell bearing occurring deformation, now flex spline's teeth will engaging-in or engaging-out between circular spline's teeth during the course of deformation, and it's in complete engaging-in at wave generator's major axis, and teeth at minor axis in complete disengagement. Wave generator usually is elliptic cam, put the cam in shell bearing, and then put them into flex spline. Now, flex spline will change from original circle to ellipse, flex spline at two ends of elliptic major axis and the matched circular spline teeth are at the complete engaging-in state, namely flex spline's external gear and circular spline's annular gear engaging-in along tooth depth. This is engagement area, usually about 30% teeth are at engagement state; When circular spline is driving, flex spline and wave

generator is driven, and system can realize increasing movement of running. When generator and circular spline is driving, and flex spline is driven, system can form differential mechanism.

IV Advantages

1).Large range of drive ratio ., 2). Can realize compensating gear easily.,
3).Larger load capability ., 4). More teeth of engagement at the same time.,
5).Better moving precision., 6).Smooth moving, without impact
7).Better drive efficiency., 8).Smaller noise.,

V Wave gear drive applications

The unique operating principles and flexible design configurations make them ideal for a wide range of applications.

1.Aerospace

Fig.3. Application in aerospace

2. Machine tools

Fig.4. Application in machine tools

3.Medical equipment

Fig.5 Application in medical equipment

4.Printing press

Fig.6. Application in printing press.

5.Communications equipment

Fig.7. Application in communication equipment

6.Industrial robots

Fig.8. Application in industrial robots

7.Measuring instruments

Fig.9. Application in measuring instruments

8.Electronic equipment

Fig.10. Application in electronic equipment

VI Literature review on harmonic gear drive

1. **C.W. Musser** The basic concept of strain wave gearing (SWG) was introduced in his 1957 patent. Authors mainly worked on symmetric teeth harmonic gear drive than asymmetric teeth harmonic gear drive

2.Mananori Kikuchi, et al made a study on stress analysis of cup type strain wave gearing. In the strain wave gearing, the flexspline is a thin wall cylinder with external teeth, the circular spline is a rigid ring with internal teeth, and a wave generator is oval bearing.

3.Huming Dong and Delun Wang has studied about elastic deformation characteristic of the flexspline in harmonic gear drive. By means of double cubic spline function, the deformation function with discrete data is fitted. The paper lays on groundwork for further kinematics analysis.

VII. Conclusion

It has been also concluded from interference analysis done in workbench .Thus may be the flexspline cup stresses will be less. It has been found that the teeth engagement is good .The torque results show that it can carry more torque as compared to normal gear and concluded that the performance of the wave gear will be far better than the other drive

References

[1] Cavdar K., Karpat F., Babalik F. B., "Computer Aided Analysis of Bending Strength of Involute Spur Gears with Asymmetric Profile", Journal of Mechanical Design, Vol. 127 / 477, MAY, 2005.
[2] Maiti R., "A Novel Harmonic Drive with Pure Involute Tooth Gear Pair", ASME, Vol. 126, January, 2004
[3] Routh B., Maiti R., "On Gearing Problem in Conventional Harmonic Drives With Involute Toothed Gear Set", Proceedings of the ASME 2011 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference, Washington, DC, USA, August 28-31, 2011.