

MODIFIED PARKINSON GEAR TESTER

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Abstract - The "Parkinson gear tester" is a very great innovation in its own & is specially made for the purpose of checking flank surfaces of gear. Gears are the crucial element of any transmission system which generally used for power transmission. Such type of part must be checked by using the highly accurate methodology in order to assess its functional performance in advance. Constant change is observed in manufacturing sector in accordance with the trouble of passing on new arrangement into reality. New machines and the frameworks are being made constantly to make diverse things at less costly rates and with high precision. Gear is most important component in the power transmission method. The gear profile is very important factor of gear application at different areas like automobiles, machine tools & other areas of power transmission. Hence the gear shape & accuracy is very important. Parkinson gear tester is an excellent testing measuring instrument for gears. Model of Parkinson gear tester testing includes the gear tooth profile through dial indicator. It can be very useful for gear testing laboratories, gear modification industries and gear repairing workshops. The inspection methodology of gears should be accurate with less time consuming procedure for its inspection. This gear test rig will check the gear in minimum time which results in a decrease of non-productive time and improves plant efficiency.

1. INTRODUCTION

Today world requires speed on each field. Hence rapidness and quick working is the most important. Now a day for achieving rapidness, man manufactures various machines and equipment's. The engineer being constantly conformed to the challenges of bringing ideas and new design into reality. Parkinson gear tester is used to test the error in the gear. Principle of this gear tester is to mount a standard gear on a fixed vertical spindle and gear to be tested on another similar spindle mounted on a sliding carriage, maintaining the gears in mesh by *spring* pressure. Movement of the sliding carriage as the gear rotates are indicated by a dial indicator. This dial indicator gives the

reading of movement of gears or it may be said that dial gauge gives the measurement of gear variations. These variations are a measure of any irregularities in the gear under test.

2. Literature Survey

DESIGN & DEVELOPMENT OF ROLLER GEAR TESTER

Constant change is observed in manufacturing sector in accordance with the trouble of passing on new arrangement into reality. New machines and the frameworks are being made constantly to make diverse things at less costly rates and with high precision. Gear is most important component in the power transmission method. The gear profile is very important factor of gear application at different areas like automobiles, machine tools & other areas of power transmission. Hence the gear shape & accuracy is very important. Parkinson gear tester is an excellent testing measuring instrument for gears. Model of Parkinson gear tester testing includes the gear tooth profile through dial indicator. It can be very useful for gear testing laboratories, gear modification industries and gear repairing workshops.

3. DESIGN & DEVELOPMENT OF PARKINSON GEAR TESTER FOR SPUR GEAR TO CHECK THE FLANK SURFACE

To check the combined tooth error different types of gear testing machines are used. Various machines have its ability to check specified parameters only. Highly precise machine required special installation and space. For checking gear in machine shop while performing machine required such an arrangement which is robust and quick one. This purpose can be solved using gear test rig. This type of gear test rig can be used for mass production of gears of a gear box.

Gear test rig is such arrangement which simplifies the measurement and saves the labour time and labour cost with greater accuracy. In gear test rig all the gears will be mounted on a plate which may be fixed or stationary as

per the requirement of the measurement. While measuring the one gear remaining will act as a master gear. This will help in finding the composite error. This test rig can be used in shop floor as it requires less space and operator can use it as per need without wasting much time. The test rig can be developed for different parameter as per measurement requirement.

3.1 Arduino Uno

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

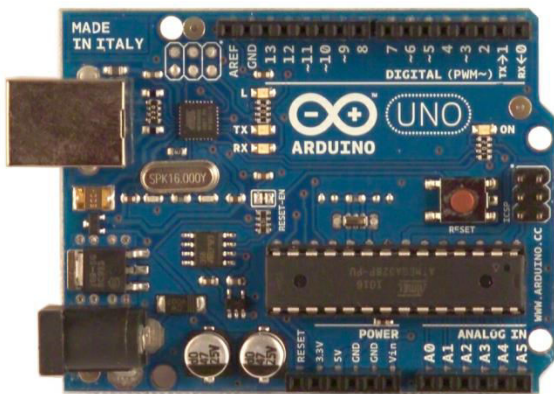


Fig 1.1 Arduino Uno

3.2 ULTRASONIC SENSOR

Ultrasonic sensors are devices that use electrical-mechanical energy transformation to measure distance from the sensor to the target object. Ultrasonic waves are longitudinal mechanical waves which travel as a sequence of compressions and rarefactions along the direction of wave propagation through the medium. Apart from distance

measurement, they are also used in ultrasonic material testing (to detect cracks, air bubbles, and other flaws in the products), Object detection, position detection, ultrasonic mouse, etc.

These sensors are categorized in two types per their working phenomenon – piezoelectric sensors and electrostatic sensors. Here we are discussing the **ultrasonic sensor using the piezoelectric principle. Piezoelectric ultrasonic sensors** use a piezoelectric material to generate the ultrasonic waves.

An ultrasonic **sensor** consists of a transmitter and receiver which are available as separate units or embedded together as single unit. The above image shows the ultrasonic transmitter and receiver.

In this tutorial, you will learn how to interface Ultrasonic Distance Measurement Sensor with AT89S52. Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measurement function. The ranging accuracy can reach to 3mm. The modules include ultrasonic transmitters, receiver and control circuit. I also Provide you complete Project code you can download it from the bottom of the page.

Now working of HC-SR04 as follow:

- Send 10us HIGH pulse on TRIG pin of HC-SR04.
- The sensor sends out a “sonic burst” of 8 cycles. And detect whether there is a pulse signal back. If there is an obstacle in-front of the module, it will reflect the ultrasonic burst.
- If the signal is back, ECHO output of the sensor will be in HIGH state (5V) for a duration of time taken for sending and receiving ultrasonic burst. Pulse width ranges from about 150μs to 25mS and if no obstacle is detected, the echo pulse width will be about 38ms.

Pin out of HC-SR04



Fig 1.2 Ultrasonic sensor

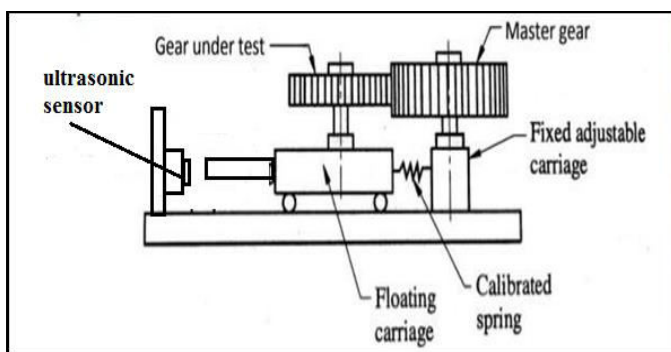


Fig -A: Sample Diagram

4.CASE STUDY

Aurangabad Automobile Engineering pvt.ltd.

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In AAEPL there is various type of products are manufactured such as manufacturing of Bright bars , Gears ,sprocket , shafts , spindles, axles, subassemblies, etc. The various type of gears are manufactured in AAEPL and also the inspection of this gear are done in industry. The inspection of these gears especially spur gear, the " **Roller Gear Tester**" is used. Roller gear tester Can be used to check the composite error and teeth to teeth error of the gear. It is used to check the different types of spur gear with the help of standard (calibrated) master gear. In this,the checking is done by manually (rotating the gear to be check which is in mesh with master gear).After checking the gear on the set up ,the visualization and marking is done by the inspector. In 12 hrs shift, the inspector can able to check only 900-1000 components on this tester.The irregularities is shown on the dial gauge having given pressure is 1.2-1.5 bar. The deflection of dial gauge must be ± 15 micron and if the deflection is exceeded this value the gear is rejected i.e- there is error in the gear.

As earlier mentioned , the company manufactures shaft gear sub-assemblies for **Bajaj Auto pvt.Ltd. (Rickshaw)**. This gear-shaft requires four gear per assembly. And total assemblies are made in AAEPL are 600-800 in 12 hrs shift. It means that they require more than 2400 inspected gears for assembly . But it's not possible to check 2400 gears on single roller gear tester set up . To fulfill this requirement company uses 2-3 roller gear tester it results in increasing the man power and poor accuracy of inspection because of its manually operated as a result 100% inspection is not possible and also customer unsatisfaction.

To avoid such major problem ultrasonic Parkinson's gear tester Can be used to check the error in gears which uses ultrasonic sensor for checking the gears faster as well as accurate and it results into mass production and customer satisfaction.

5. CONCLUSIONS

- This project brought together several components and ideas to achieve a common goal viz. person can check the composite error with higher accuracy.
- As springs and slider table provide with roller it will provide flexibility of checking composite errors of different types of gear.
- Ultimately it overcomes the limitation of test rig for checking only spur gears.
- It provides flexibility of checking gears having maximum outer diameter up to 150mm.
- Reduces time for checking composite error, initial cost and maintenance cost of test rig.
- It is very useful in mass production of any types of gear.

6.ACKNOWLEDGEMENT

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