ISSN 2277 – 5528
Impact Factor- 3.145

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & MANAGEMENT

A REVIEW PAPER ON MULTI SPEED RIGHT ANGLE FRICTION GEAR

Bhushan Mali [1], Shubham Kshirsagar [2], Roshan Deshmukh [3], Kamble Sanket [4], Mr.Ambare R.P.[5]

[1,2,3,4]Students, Department of Mechanical Engineering, Jaihind polytechnic Kuran, Junnar, Pune.
[5]Lecturer, Department of Mechanical Engineering, Jaihind polytechnic Kuran, Junnar, Pune.

ABSTRACT

Since the very beginning of evolution of human beings, he has craved for faster and efficient processes. No matter what difficulties faced new product kept on developing. And as the time kept on passing, faster and more efficient machines were developed. There was no sudden or drastic change in making a process or machine faster, so rather than making new designs the existing designs were modified. As we know, no machine in the universe is the 100% modified machine, so there is always a scope of modification of the existing machine. This system enables efficient and modernized speed variation system in the field of automobiles and overcomes the drawbacks of other speed variation system.

I. INTRODUCTION

Machine tools are precise and complex machines which are to produce various types of components by metal cutting, for removing the metal from work piece, a relative motion is necessary the tool and job. The various motion characteristics of machine tools are work motions and auxiliary motions.

The solution is a multispeed right angle friction gear which works on the principle of friction. This drives enables us to have a multi speed output at right angles by using a single control lever. The design of the drive is based on the principle of friction, hence slip is inevitable, but in many cases the exact speed ratio is not of prime importance it is the multiple speed that are available from the drive that are to be considered. I this typical drive the power transmitted from the input to the output at right angle at multiple speed and torque by virtue of two friction rollers and an intermediate sphere. The drive uses a singular control to effect the speed change, thereby making the operation of the drive extremely simple. Another important feature of this drive is its compactness. Low weight and its low cost.

II. SYSTEM DESIGN

System design mainly concern with various physical constraints, deciding basic working principle, space requirements, arrangement of various components etc.

Following parameters are looked upon in system design:-

A. Selection of system based on physical constraints. The mechanical dings has direct norms with the system design hence system is designed such the distinctions thus obtained in mechanical design can be well fitted into it.
B. Arrangement of various components made simple to utilize every possible space.
C. Ease of maintains and servicing achieved by means of simplified layout that enables quick decisions assembly of components.
D. Scope of future improvement.

MECHANICAL DESIGN

In mechanical design the components are listed down and stored on the basis of their procurement in two categories,

- Design parts
- Parts to be purchased

For designed parts detail design is done and dimensions there obtained are compared to next dimension which are already available in market. This simplifies the assembly as well as the post production and maintains work. The

ISSN 2277 – 5528
Impact Factor- 3.145

various tolerances on work are specified. The process charts are prepared and passed to manufacturing stage. The parts to be purchased directly ore selected from various catalogues and are specified so as to have case procurement. In mechanical design first stage is selection of appropriate material for the part to be designed for specific application is done.

III. SYSTEM CONSTRUCTION

The construction of this multispeed right angle friction gear is analyzed as a complete solution to variable speed transmission. It consists of following elements.

- **Input friction disk:-**

Input friction disk is a high grade steel (EN 24) construction coupled to motor at one end by pulley and belt and is held in heavy duty ball bearing (6204)and (6203) at the input bearing housing end.

- **Friction roller:-**

Friction roller is modified in construction that a spherical radius is turned on the face of this disc whose outer surface serves as the friction surface. This friction roller is driven by the input friction disk and its face is lined with friction material fared.

- **Fork:-**

The fork is the member that houses the friction roller and moves it up or down with respect to the input friction disk. It is mounted on the feed screw.

- **Feed screw:-**

The adjuster screw carries the fork and it is held on the casing in two bearing housings. The feed screw serves to adjust the position between the input friction disk and the friction roller, so it serves as a speed changer.

- **Contact pressure mechanism:-**

The contact pressure mechanism is in the form of an adjuster screw held in a nut in the casing and a helical compression spring that rests against the output shaft bearing housing. One such set is provided at each end of the output shaft. The compression of the spring results in the contact pressure between the friction disk and roller, which can be dueling adjusted by mean of the adjuster screw.

- **Wear compensating mechanism:-**

This is in the form of a wear compensating screw that is mounted in the casing and it rests against the output bearing housing at each end of the shaft. This screw is adjusted to adjust the wear.

- **Output shaft:-**

Output shaft is a high grade steel (EN24) which is keyed to output friction disk at one end and the load at the either end. It is housed in the heavy duty ball bearing (6203) housed in the casing.

- **Pulleys:-**

The pulleys are mounted on the input and the motor and are connected via v-belt.

- **Frame:-**

The frame is an open construction fabricated from MS Angle, ht other members in the form of bearing housing (1, 2 or 3) and the holding block being welded to it. It is robust construction and encloses all moving members inside it.

ISSN 2277 – 5528
Impact Factor- 3.145

IV. SYSTEM WORKING

Motor is switched on, which makes the motor shaft to dive the input shaft. Input shaft rotates the input friction disk at a high speed. The friction disk rotates the friction roller which in turn rotates the output shaft. The speed of the output shaft depends upon the radius of rotation.

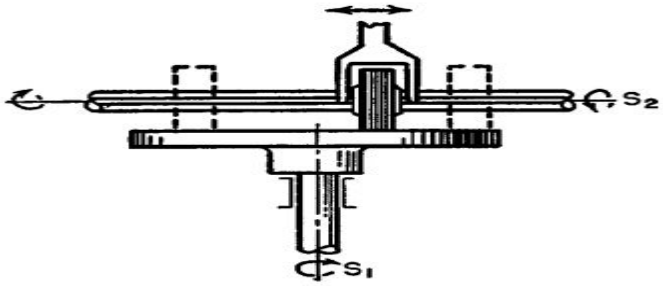

Figure 1:- Diagram of basic principle

This radius of rotation can be controlled by regulating the rotation of the feed screw. The feed screw when rotated about its own axis moves the fork up or down there by changing the radius of rotation .the pitch of screw is 2mm thus per rotation the roller moves by 2mm , the working range of the disk is 75mm on either side of the centre of the disk. The direction of the rotation of the output shaft can be reverse by moving the roller on the opposite side of centre of the input fiction disk.

V. COMPARISON BETWEEN GEARBOX AND RICTION GEAR

Table 1:-Comparison between gearbox and friction gear

Sr. No.	Parameters	Gearbox	Friction gear
1	Cost	High	Low
2	Weight	High	Low
3	Size	Bulky	Compact
4	Slip	No	Significant at high torque
5	Torque transmission capacity	High	Medium & low
6	Exact speed ratio	Yes	No
7	Number of speed ratio	Limited	Infinite
8	Speed change	Shocking	Gradual & shockproof
9	Dissipation of heat generated	Simple	Difficult as dry friction
10	Noise	High	Low
11	Application	Automobiles	Conveyor line, wire winding, balancing m/c, assembly line.

ADVANTAGES

- Easy to maintain proper pressure between the contacts surfaces thereby resulting in trouble free operation.
- Multispeed can be obtained; where as regular clutches are on-off where only one speed is available.
- Infinitely variable speed available over a given range.
- Ease of operation, the speed changes is gradual, without any shock.

ISSN 2277 – 5528
Impact Factor- 3.145

- singular control:-
  Entire range of speed is covered by a single hand wheel control.
- Low cost.
- Compact size.
- Bi-directional power transmission, thereby enabling to also reverse the direction of the drive.

DISADVANTAGES

- The amount of slip becomes significant of high torque conditions, which reduces the velocity ratio making in accuracies in power and motion.
- Noise pollution.
- More friction produced.

APPLICATIONS

- By combination the adjustable spherical drive and a three stage all gear head stock a still wide range of speed can be obtained for the main spindle of light duty machine tools.
- Feed drives for machine tool slides, machine tool slides can be moved at different speeds to impart feeding motion to the cutting tool.
- Variable speed drives for conveyors in assembly line and automatic assembly of plants.
- Variable speed drives in automatic transfer lines and pick and place robotics devices.
- Variable speed drive for balancing machines in testing equipment's.

VI. FUTURE SCOPE

- Casing in the present case is a fabricated one but it actual practice it cannot be a casting to add more compactness to the drive.
- The speed changing mechanism presently is manually operated which can be further modified by connecting it to be servo motor to make it microprocessor band control. This will enable to have a truly infinite variable speed and speed can be minutely changed i.e. $\pm$ 0.5 rpm etc.
- This could also be converting into a wet friction type clutch by modifying the liner material and oil tight casing with proper heat dissipation facility.

VII. SUMMARY

- In multi speed right angle friction gear by using plate achieve variable speed. This speed variation achieve without changing motor speed.
- Friction roller moves upward and ward with the help of controller. Roller moves downward, output shaft motion is upward. And roller moves upward output shaft motion is reversed.

REFERENCES

1. *Newell & Horton, "Ingenious mechanism for designers & inventors" 1967.*
2. *P.C.Sharma, "production technology" Jan. 2007 S.chand.*
3. *Dr. Kripal Singh. "Automobile Engineering."*
4. *R.S.Khrumi and J.K.Gupta. "Theory of Machines." Revised Edition, Eurasia Publishing House, 2005.*
5. *Mahadeven, "PSG Design Data Handbook.", CBS Publisher, 3rd edition.*
6. *R.B. Patil, "Design of Machine Element", Techmax Publications, Pune, July 2005.*