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A CONTINUOUS VARIABLE TRANSMISSION

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ABSTRACT

The primary function of a belt drive in lathe machines is to transmit mechanical power from a power source to some form of useful output. The Conventional transmissions allow for the selection of discrete speedratios, thus limiting the machine to providing maximum power or efficiency for limitedranges of output with high chances of slip of belt. Our idea is to create such a device , that allows an infinitely variable ratio change within a finite range, thereby allowing the machine to continuously operate in its most efficient or highest performance range, while the transmission provides a continuously variable output to the load with the minimum chances of slip of belt.

Keywords : Belt Drive , Lathe Machines , Conventional Transmission , Dicrete Speed Ratios , Slip of Belt , Infinitely Variable Ratio , Continuously Variable Output

I. INTRODUCTION

The primary function of any transmisson system is to transmit mechanical power from a power source to some form of useful output device. Since the invention of lathe machines , it has been te goal of tranmission designers to devlop more efficient methods of transmitting power to lathe machines. The origin of turning dates to around 1300 BCE when the Ancient Egyptians first developed a two-person lathe. One person would turn the wood work piece with a rope while the other used a sharp tool to cut shapes in the wood. Ancient Rome improved the Egyptian design with the addition of a turning bow. In the Middle Ages a pedal replaced hand-operated turning, allowing a single person to rotate the piece while working with both hands. And thus may different madifications were made in lathe machines to increase ease of power transmission and to improve efficiency.

Stepped pulley drive is used for tranmission of power in today's lathe machine which also gives dicrete speed ratios.

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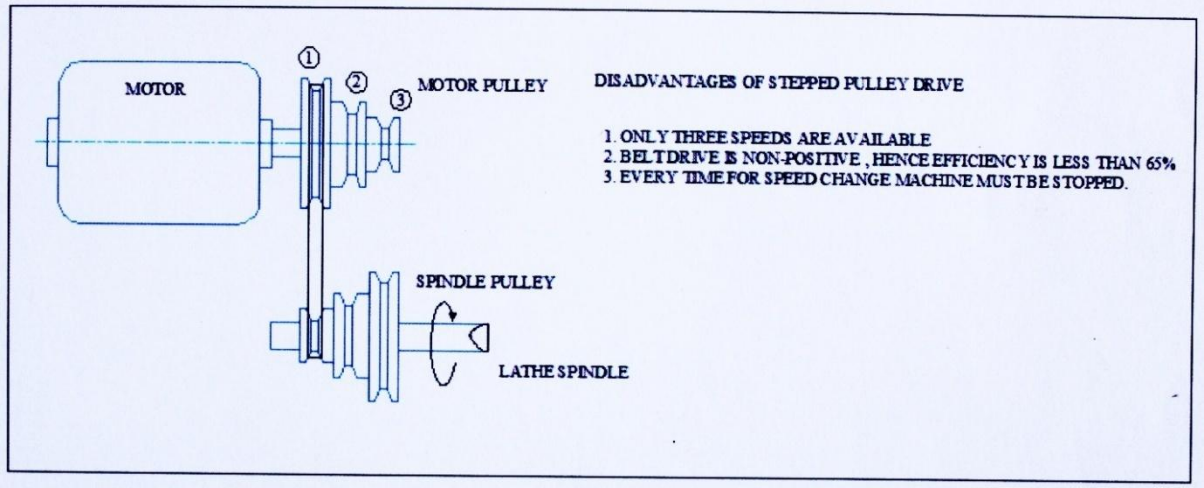

A continuous variable transmission sysytem is a device which gives infinietly variable ratio change within finite range , thereby allowing transmission system to operate in its most efficient or highest performance range.It is a device in which one speed ratio without breaking or stopping the input power. Thus A Continuous Variable Transmmision allows change in speed ratio in working condition i.e without stoping the lathe.

II. CONSTRUCTION OF A+CVT

2.1. Motor:

Motor is an single phase AC motor, capacitor run three lead motor with the following specifications:

Power = 50 watt

Speed = 0 to 9000 rpm (Variable)

2.2. Open belt drive:

The open belt drive is used to transmit the power from the input source that is the motor to the input cone shaft. Motor pulley is 20 mm diameter where as the input cone shaft pulley is 110 diameter. The reduction ratio is thus 5.5 between the motor and input cone shaft. The power is transmitted by an FZ-section belt between the motor pulley and cone shaft pulley.

2.3. Input cone shaft:

The input cone shaft is basically an sub assembly of the base shaft, two sprocket bar holder rings on either side and the sprocket bars. The sprocket bars are solid round bars 4 mm diameter held in radial holes in the holder rings. Holder rings are keyed to the base shaft and the sprocket bars are located on an radial pitch along the generators of the cone. The base shaft is held in heavy duty ball bearings at either ends, and carries the input pulley at one end.

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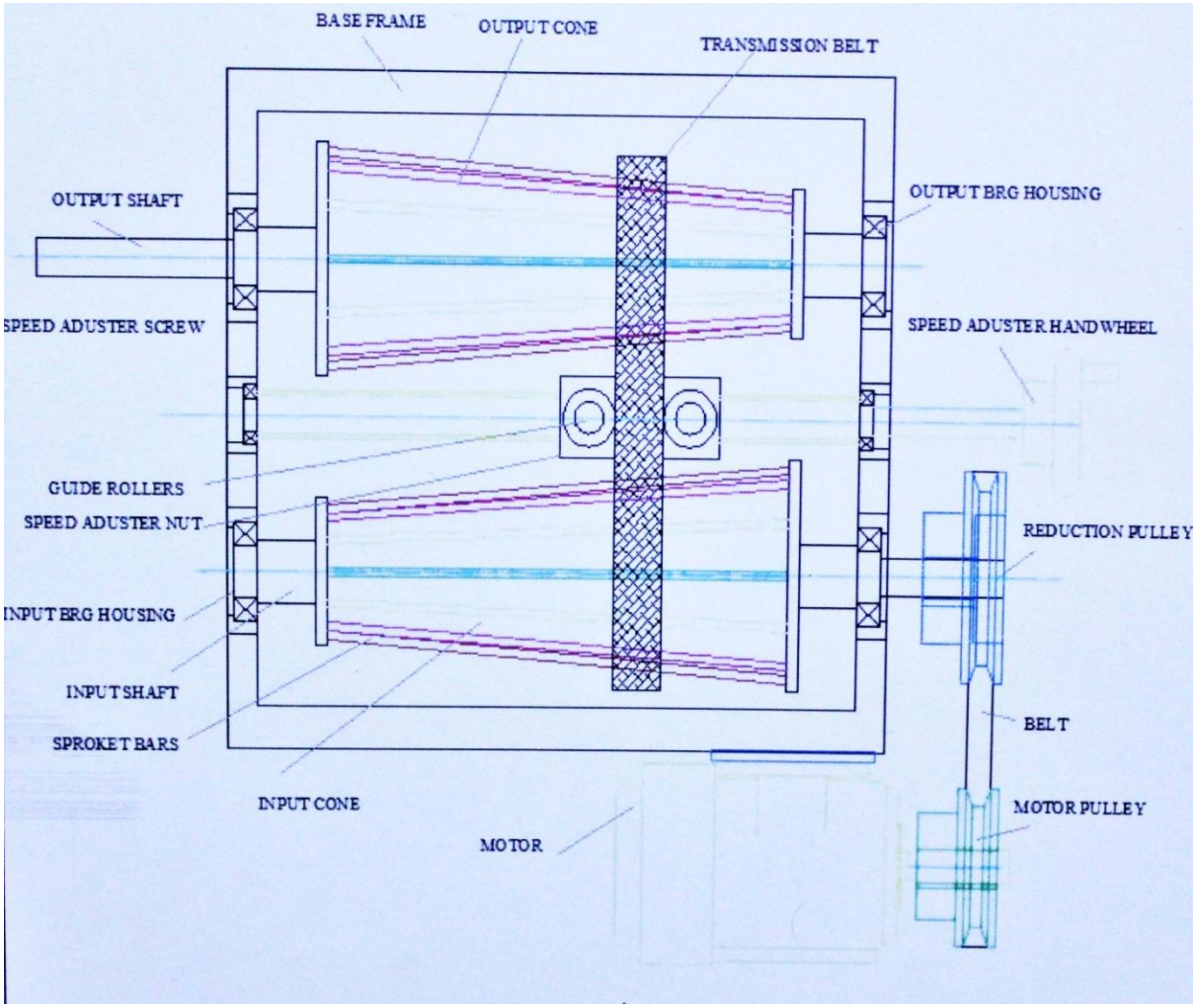
2.4. Output cone shaft :

The output cone shaft is basically an sub assembly of the base shaft, two sprocket bar holder rings on either side and the sprocket bars. The sprocket bars are solid round bars 6 mm diameter held in radial holes in the holder rings. Holder rings are keyed to the base shaft and the sprocket bars are located on an radial pitch along the generation of the cone. The base shaft is held in heavy duty ball bearings at either ends, and carries the dynobrake pulley at one end.



2.5. Input/output bearing housings:

The input and output bearing housing hold the ball bearing for respective base shafts and they are bolted to the base frame.

2.6. Transmission Belt:

The transmission element of the CVT is PIX ‘X’ treme classical synchronous belt with the following features.

a) Trapezoidal tooth profile

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b) High efficiency due to positive engagement between belt teeth and sprocket bars

c) No re-tensioning due to positive engagement between belt teeth and sprocket bars

d) Free from maintenance

e) No high tension required

2.7. Speed Adjuster Mechanism:

The speed adjuster mechanism is in the form of an screw and nut arrangement, where in the screw and the nut arrangement, where in the screw is held in ball bearings at either ends and carries a nut which holds the belt guide mechanism in the form of free rotating rollers. The screw carries the hand wheel at one end for speed change.

2.8. Base Frame:

Base frame is the structural element that supports the entire assembly of the drive and the motor.

III. WORKING OF A+CVT

When the motor is started the motor pulley rotates the input pulley by means of the FZ section V-belt. The input pulley drives the base input shaft which in turn rotates the holder rings and the sprocket bars engaged in the holder rings. The sprocket bars engaged in the teeth of the transmission belt give motion to the transmission belt. The transmission belt is guided in the rollers mounted on the speed change nut. The belt teeth engaged in the sprocket bars of the output cone shaft drive the sprocket bars and thereby the holder rings and the base output shaft. The output shaft drives the dyno brake pulley mounted at its end.

3.1. Effecting Speed Change:

The speed changes are effected by means of the speed adjuster mechanism. When the hand-wheel of the speed change screw is turned the screw freely rotates in ball bearings making the speed change nut to translate either to left or right depending upon whether speed is to be increased or decreased. The translation of nut will translate the belt by roller arrangement thereby changing the radii of contact on input and output cone hence speed change is achieved.

IV. ADVANTAGES

1 The sprocket bars are made round in shape and are made integral with the cone,this reduces the problem of vibration and chatter.

2 The simple round shape of the sprockets bars make engagement and disengagement of the transmission belt easy, and vibration free so also offering an positive engagement, unlikely of any slip.

3 The simple shape of the sprocket bars makes the manufacturing process easy and at low cost.

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4 The transmission element of the A+ CVT is PIX 'X' treme Classical Synchronous Belt.
Belt being standard element low cost and easy availability.
5 More than 150 gears ratios possible.
6 Speed changing is single lever control,hence easy.
7 Step-less speed variation hence instant acceleration possible.
8 Neutral position can be achieved with minimal modification.
9 Compact in size, low in weight.
10 Low cost and easy to apply.
11 Can be applied both to automobile and mechanical industry.

V. CONCLUSION

In conventional transmission devices, it was very inconvenient to change speed ratios in running condition. The continuous variable transmission is the perfect solution to the problem in gspped ratio variation. It is the perfect method of speed ratio variable with simple mechanism in running time provide operational flexibility.Thus by choosing the above objective features of the CVT the problems mentioned in conventional transmission mechanism have been overcome, and lower manufacturing cost, simplicity of operation and compactness with low weight is achieved in the CVT.

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