Vee belts and their advantages and disadvantages

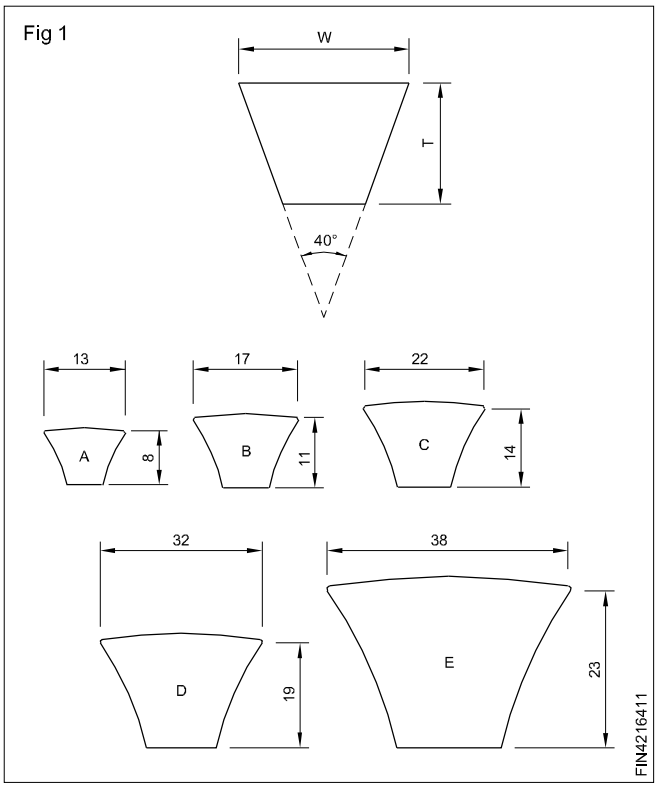
Objectives : At the end of this lesson you shall be able to
- **name of different types of belt**
- **state the advantages of 'V' belt**
- **state the classification of 'V'belt**
- **state the designation of V- belt**

V- belts

'V' belt drives are generally used when the distance between the shafts is too short for flat belt drives. Owing to the wedge action between the belt and the sides of the groove in the pulley,the V belt is less likely to slip,hence more power can be transmitted.

The endless V belt is shaped roughly like a trapezium in cross- section,and is made of cord and fabric,and is treated with rubber and moulded together in a uniform manner and shape. The cross-sectional symbol of a V - belt is shown in Fig 1.

Fig 1



Advantages of V-belt drive

- It is compact, so installation is possible in limited space.
- It is used when the centre distance between the driver and the driven pulleys is short.
- Less vibration and noise.
- Cushions the motor and bearing against load fluctuation.
- Easy replacement and maintenance.

Classification of 'V'belts

The 'V' belts are classified into 5 groups as per IS.2494-1974 namely A,B,C,D and E. The nominal included angle of the V-belt shall be 40°.

Table 1 given below lists the standard sizes of V-belts from Section A to E.

TABLE - 1

Cross-section Symbol	Nominal Top Width W (mm)	Nominal Thickness (T)
A	13	8
B	17	11
C	22	14
D	32	19
E	38	23

Individual manufacturer's belts may deviate slightly from these dimensions for various constructional reasons. Crowning, if any, in belts should be disregarded for the measurement of thickness.

Designation of V-belt as per IS.2494

The V belts conforming to this standard shall be designated by the cross-section symbol, nominal inside length and the number of IS: standard.

Example

C 3048 IS: 2494

C = V-belt cross-section

3048 = Nominal inside length in mm. in untensioned state.

'V' belts creep, slip

Objectives : At the end of this lesson you shall be able to
- **list the use of commercial 'V' belt**
- **brief the term creep and slip**
- **explain the purpose of belt dressing**
- **calculate length of open belt**

Use of commercial belt

A belt is a loop of flexible material used to link two or more rotating shafts mechanically,most often parallel. Belts may be used as a source of motion, to transmit power efficiently or to track relative movement. Belts are looped over pulleys and may have a twist between the pulleys, and the shafts need not be parallel.

In a two pulley system, the belt can either drive the pulleys normally in one direction (the same if on parallel shafts), or the belt may be crossed, so that the direction of the driven shaft is reversed (the opposite direction to the driver if on parallel shafts). As a source of motion, a conveyor belt is one application where the belt is adapted to carry a load continuously between two points.

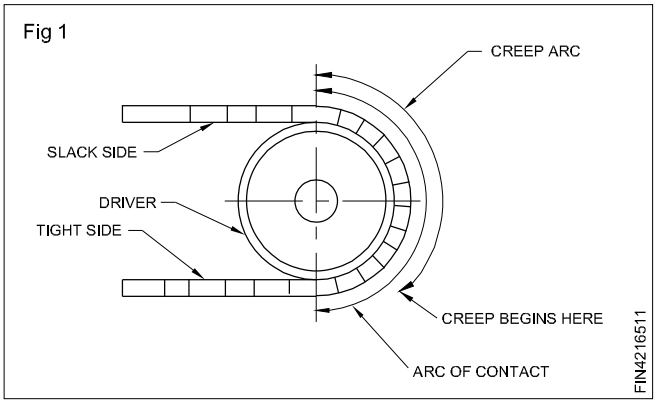
Commercial belts are mainly used in home appliances like,grinder,mixie and washing machine etc.

Creep and slip of belt (Fig 1)

As the belt turns on a pulley it tends to strech on the contact area of the driving pulley and shorten on the driven pulley. This localised movement of the belt is a direct result of the elastic stretch and is known as creep, Greater the load more will be the creep. The figure shows the condition of belt as a result of creep.

Slip is the actual difference caused between the surface speed of the belt and pulley. The effect of slip may be reduced by decreasing the pulley ratio and maintaining proper alignment. Creep, being the physical characteristic of the belt, cannot itself be controlled. Slip and creep jointly cause power loss.

Fig 1



Belt dressing

Due to the continuous rubbing of the belt on the surface of the pulley the belt gets dried up due to friction, and heat is generated. This causes the belt to slip.

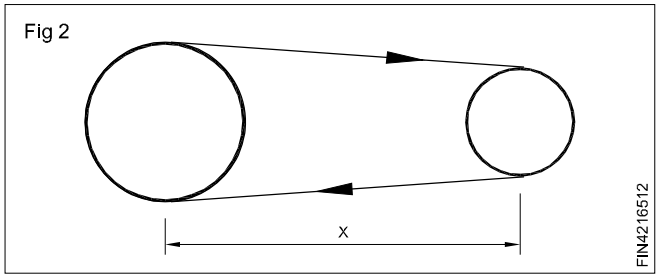
To keep the belt supple and free from cracks, belt dressing is appliled. Tallow or powdered resin are good dressing materials which are applied on the inner face of the belt. This improves the gripping property of the belt.

Open belting (Fig 2) calculation

If L = length of open belting
D = dia. of larger pulley
d = diameter of smaller pulley
x = centre distance between the pulleys

$$\text{then, } L = \frac{D+d}{2} \times 3\frac{1}{7} + 2x$$

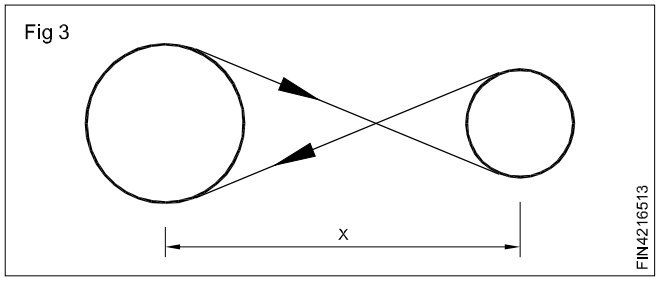
Fig 2



Cross-belting (Fig 3)

If L_C = length of cross-belting
C = circumference of larger pulley
c = circumference of smaller pulley
R = radius of larger pulley
r = radius of smaller pulley
x = centre distance between the pulleys

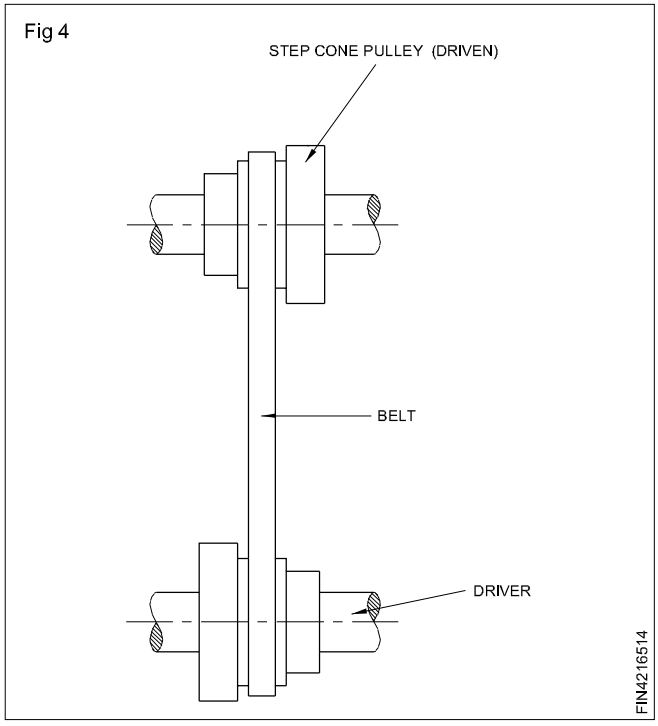
$$\text{then, } L_c = \frac{C}{2} + \frac{c}{2} + 2\sqrt{x^2 + (R+r)^2}$$



stepped drives (Fig 4)

Stepped drives are used to obtain different speed ratios. Pulleys of different sizes are employed.

Three different speeds can be obtained by changing the belt position from one step to another.



Right angled drive (Fig 5)

This drive is employed between shafts at right angles using tide pulleys. In this the horizontal drive is converted into vertical drive with the help of the guide pulleys