

FACTFILE: GCE TECHNOLOGY & DESIGN

1.21 PNEUMATIC AND MECHANICAL COMPONENTS



Pulleys and Jockey wheels

Learning outcomes

Students should be able to:

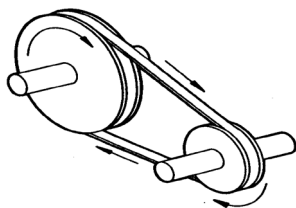
- demonstrate knowledge and understanding of the following mechanical components:
 - pulleys and belts (single pulley, flat, round, vee and toothed belts;
 - fixed and self-adjusting jockey wheel or pulley.

Course content

Pulleys

Simple pulley systems

One method of transmitting rotary motion from one



shaft to another is by using pulleys and belts. The graphic symbol for a simple belt and pulley system is shown below:

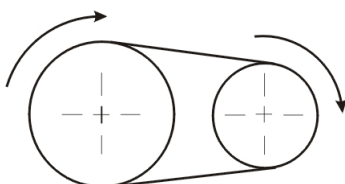


Fig 1

There are many types of belts used to connect the pulleys together but one of the most common type is the vee belt. This belt fits tightly into the groove on the pulley wheel to keep slip reduced to a minimum.

Flat, round,vee and toothed belts

Common workshop machines such as large pedestal type drills, lathes and milling machines can use vee belts. The precise type of belt used can vary from model to model and the requirements of the application.



Fig 2

Machines used in the domestic environment such as washing machines and vacuum cleaners can use round belts due to the size of the forces involved.

In the past transmission of motion from engines to machines was achieved using flat pulleys and belts. These were commonly used in agricultural machines such as traction engines and threshing machines.



Fig 3

In applications where slippage between belts and pulleys is unacceptable a toothed belt and pulley is used. This is mainly for timing mechanisms such as driving a camshaft in a car engine.

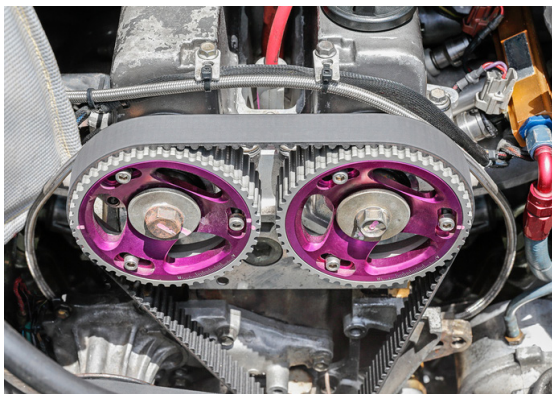


Fig 4

The pulley wheels are attached to shafts by grub screws or key and keyways.

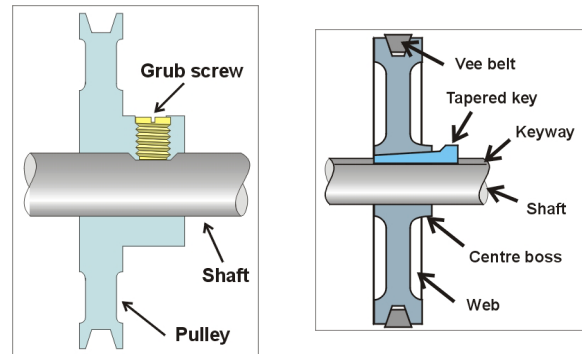


Fig 5 & 6

It is possible to change the speed by using different sized pulleys on the driver and driven shafts. If we compare the diameters of the two pulley wheels it is possible to calculate the velocity ratio of the system.

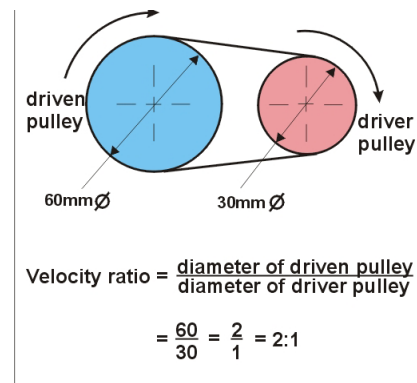


Fig 7

When a machine is being driven by a pulley and belt system, the velocity of rotation of the machine shaft is determined by the velocity of rotation of the driving motor and the size of the pulleys.

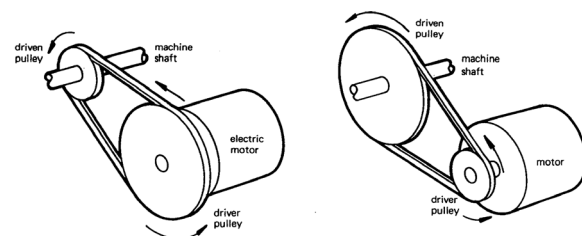


Fig. 8 Rotary velocity increase, Rotary velocity decrease

Occasionally it is necessary to have both shafts rotating in the same direction. This can be achieved by crossing the pulley belt. The graphic symbol is shown below:

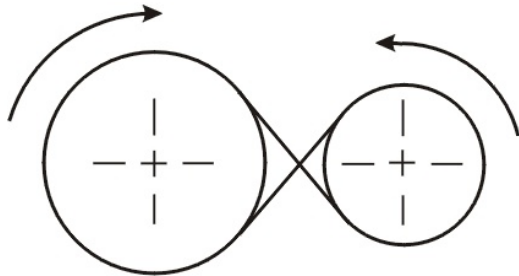


Fig 9

It is necessary to offset the alignment of the pulleys as the belt has to cross without touching itself.

Jockey Pulley

It is important that the belt in a pulley system is the correct tension. If the belt is too tight it can cause bending forces to the pulley shafts and if it is too slack, the belt can slip or come off the pulleys. There are two common methods of ensuring that the belt is adjustable to set the correct tension:

1. Jockey Wheels

A jockey pulley is an additional pulley which ensures that the tension of the belt is correct, and keeps the maximum amount of belt in contact with the driver and driven pulley. Jockey pulleys are often spring loaded.

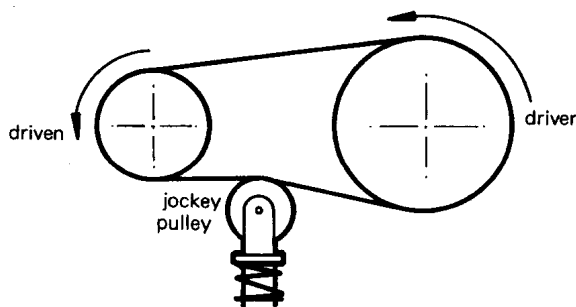


Fig 10

2. Adjustable Pulley

By including an adjustable pulley in the system, the tension can be set and the adjustable pulley is locked in place as shown in the photograph.



Fig 11

Multiple Pulley Blocks

Stacked vee pulleys and vee belts

When large torques are transmitted between shafts, stacked pulleys are used with several driving belts.



Fig 12

Stepped Cone Pulleys

These type of pulley arrangements allow machines to operate at a range of speeds. Standard school pillar drills contain this type of pulley arrangement and the shaft speed can be changed for drilling different types of materials.



Fig 13

? Revision Questions

- 1 Self-adjusting jockey wheels can be employed in pulley systems.

Explain why they may be required and how they function.

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