Shell bearings

In this lesson, some more useful points are discussed on the shell bearings. They are stated as below:

- Qualities of engine bearings
- Bearing materials
- Bearing spread and crush
- Bearing failures and remedies
- Connecting rod and camshaft bearings
- Load on precision insert bearings
- Advantages of using insert bearings.

Crankshaft balancing, firing order of the engine

Objectives: At the end of this lesson you shall be able to
- **state the types of crankshaft balancing**
- **state the importance of the crankshaft balancing**
- **state the function of firing order.**

Balancing of crankshaft

Internal combustion engines have reciprocating parts and they create vibrations, when the engine is running. Every two revolutions of the crankshaft one power impulse in four stroke engine. Balancing of the engine is necessarily required for smooth running of the engine.

The crankshaft is subjected to torsion vibration and engine vibration. Engine vibration is due to the uneven weight distribution on the crankshaft and the unbalanced reciprocating forces of pistons and connecting rods. Balancing is achieved by removing materials (by drilling) in the crank web or by adding weight to the shaft between centres in a special balancing machine.

Types of balancing

There are two types engine balance, (i) power balance (ii) mechanical balance

Power balance: When the engine power impulses occur at regular intervals with relation to the revolution of the crankshaft and each power of the engine impulse exerts the same force.

Mechanical balance: Engine assembling parts of crankshaft connecting rod and pistons are rotating in reciprocating motion, so that crankshaft counter balanced in operation mechanically minimize the vibration of the engine. The rotating parts of an engine can be balance by bringing them into static and dynamic balance. The main rotating parts are balanced mechanically by crankshaft counter weight and flywheel piston and connecting rods shocks on crankshaft are called primary intertie force. The angularity of the connecting rods produce secondary vibration, it is called secondary intertie force. The perfect static and dynamic balance of crankshaft and flywheel reduce the vibration.

Firing order: The sequence of power impulses occur is an engine is called firing order. The firing order in which cylinder deliver their power strokes is selected as a part of the engine design to obtain the best engine performance. The firing order is shown by the sequence of the number of cylinder in which the cylinder deliver their power strokes. Which is the nearest cylinder to radiator is designated as number one cylinder in an inline engine

Three cylinder 1 -3 -2

Four cylinder 1 -3-4-2

Five cylinder 1-3-5-4-2

Six cylinder 1-5-3-6-2-4

Eight cylinder inline engine 1-8-7-3-6-5-4-2

Eight cylinder v8 engine 1-3-2-5-8-6-7-4

Flywheel

Objectives: At the end of this lesson you shall be able to
- **state the function of flywheel**
- **state the construction of flywheel.**

Function of Flywheel

The flywheel stores energy during the power stroke and supplies it to the crankshaft during the idling stroke i.e. suction, compression and exhaust. In many engines the flywheel also serves as a mounting surface for the clutch.

Construction

The flywheel Fig 1 is attached to the rear end of the crankshaft (1) by means of bolts (4). A large ring gear (3) is attached to the flywheel. While starting, the engine starter motor ‘s gear engages with the ring gear (3), and the flywheel (2) rotates to crank the engine. When an automatic transmission is used the torque converter assembly acts as the flywheel. The flywheel also serves as a mounting and frictional surface for the clutch assembly. The size of the flywheel depends upon the number of cylinders and general construction of the engine.

Timing marks of the flywheel

An engine is provided with timing marks (Fig 2) on a rotating member and a stationary pointer. The timing mark (1) in punched on the circumference of the flywheel / crank

pulley. A pointer (2) is fixed on the flywheel housing (3) / timing cover. Timing is adjusted when the pointer (2) coincides with the flywheel mark (1) and at this times distributor contact should just start at open.

Fig 1

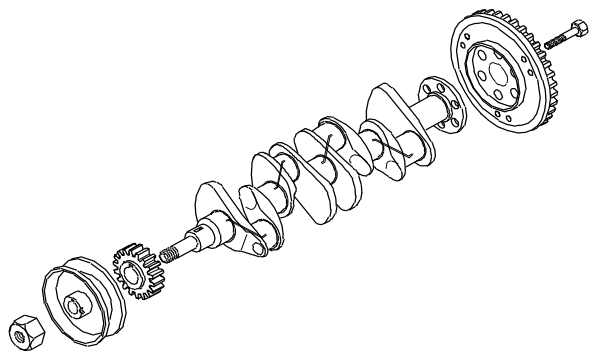

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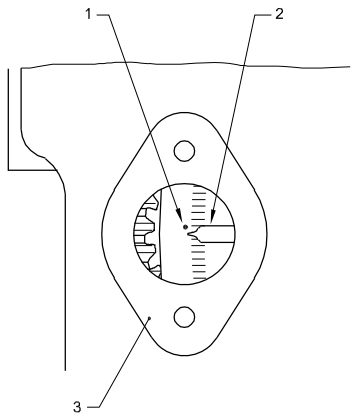
Fig 2



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Vibration damper

Objective: At the end of this lesson you shall be able to
- **Functions of a vibration damper.**

Vibration dampers are fixed the front end of the crankshaft.

The main function of a vibration damper is to reduce torsional vibrations and stress. It helps in reducing the flywheel weight and increases the crank-shaft life.

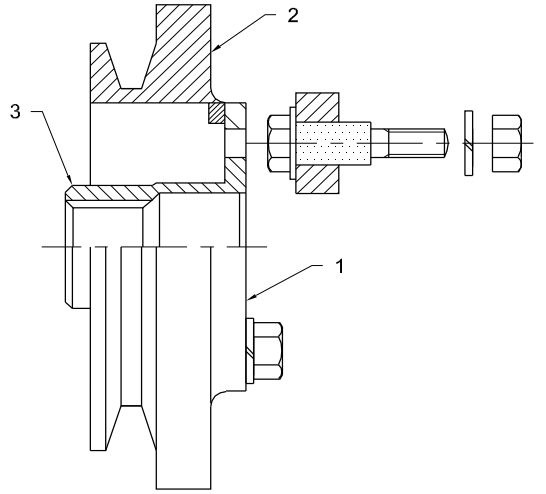
Types and Construction

There are mainly two types of vibration dampers in use.

Rubber floating type

The damper (Fig.1) is made into two parts, a small inertia ring or damper flywheel (1) and the pulley (2). They are bonded to each other by a rubber insert (3).

Fig 1



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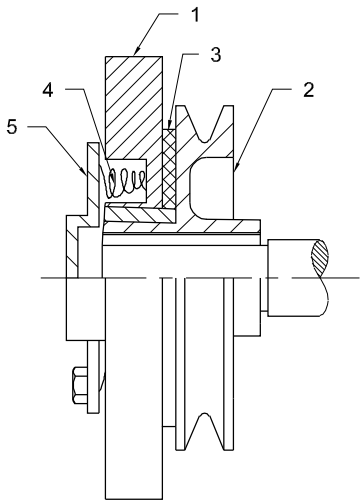
As the crankshaft speeds up or slows down, the damper flywheel has a dragging effect. This effect slightly flexes the rubber insert (3) which tends to hold the pulley and crankshaft to a constant speed. This tends to take on the twist and untwist action and torsional vibrations of the crankshaft.

Clutch and rubber bush dampers

In this type (Fig 2), in between the damper (1) and the pulley (2), two friction facings (3) are provided. A spring (4) and a plate (5) are fixed to control the friction between the damper (1) and the pulley (2).

Fig 2



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