Modern Automotive Technology
Chapter 15

Engine Front Construction
Learning Objectives

- Describe safety practices related to working on the front end of an engine
- Explain the function of the vibration damper
- Compare the three types of camshaft drives
- Summarize the construction of engine front covers, oil slingers, and other related parts
- Explain the construction of a timing gear, timing chain and timing belts assemblies
Engine Front End

- Consists of the parts that attach to the front of the engine
- These parts include:
  - Camshaft drive mechanism
  - Front cover-mounted oil pump
  - Water pump
  - Auxiliary shaft
  - Vibration damper
Vibration Damper Construction

- Harmonic vibration is a high-frequency movement resulting from twisting and untwisting of the crankshaft.
- If harmonic vibration is not controlled, the crankshaft could vibrate, resulting in a broken crankshaft.
Vibration Damper

- Also called a harmonic balancer
- Keyed to the crankshaft snout
- Controls harmonic vibration
- Cuts load variation on the engine timing belt, chain, or gears, so these parts last longer
Vibration Damper

Constructed of a heavy wheel mounted in rubber
Vibration Damper

- Inertia ring
- Rubber ring
- Sleeve
- Crankshaft pulley
1. The **BELT TENSIONER** is a spring-loaded wheel that keeps the timing belt tight on its sprockets.

2. The **TIMING MARKS** show the technician how to install the gears properly.

3. The **CHAIN TENSIONER** is a spring-loaded plastic or fiber block that may be used to take up slack caused by wear.
Crankshaft Pulley

- Operates belts for the alternator, water pump, and other units
- May be part of the harmonic balancer, or bolted to the front of the balancer
- Provides either V or ribbed grooves for the belts
Camshaft Drive Construction

- Camshaft drive must turn the camshaft at one-half of the crankshaft speed
- There are three types of camshaft drives:
  - timing gears
  - timing chain and sprockets
  - timing belt and sprockets
Timing Gears

- Commonly used for heavy-duty applications
  - trucks, taxicabs, and diesel engines
- Very dependable and long lasting design
- Noisier than a chain or belt drive
Timing Gears

- Two timing gears are used to drive the camshaft
  - one on the crankshaft and one on the camshaft
- Cam gear is twice the size of the crank gear
  - provides a 2:1 reduction
Timing Gears

Timing marks show the technician how to install the gears properly.
Timing Chain and Sprockets

- Used to turn the camshaft
- Crank sprocket is keyed to the crankshaft snout
- Cam sprocket, with either metal or plastic teeth, bolts to the camshaft
- Timing chain transfers power from the crank sprocket to the cam sprocket
Timing marks must line up to time the camshaft with the crankshaft.

Timing Chain and Sprockets
Timing Chain and Sprockets

- Chain guide
  - may be needed to prevent chain slap
- Chain tensioner
  - may be used to take up the slack in the chain as it and the sprockets wear
  - spring tension is used to push a plastic or fiber block outward, keeping a constant tension on the chain
OHC Timing Chain
DOHC Timing Chain
Auxiliary Chain

- May be used to drive the engine oil pump, balancer shafts, and other units on the engine.
- Driven by an extra sprocket, usually placed in front of the crankshaft timing chain sprocket.
4. The **HARMONIC BALANCER** is a heavy wheel mounted in rubber to control vibration.

5. The **OIL SLINGER** is a washer-shaped part that fits in front of the crankshaft sprocket.

6. A **CHAIN GUIDE** is used to prevent chain slap.
Engine Front Cover

- Also called a timing cover
- Bolts to the front of the engine
- Encloses the timing chain or gear mechanism
- Prevents oil leakage from the front of the engine
- Made of thin, stamped steel, or cast aluminum
Engine Front Cover

Holds the front oil seal, timing pointer, probe holder, and other parts
Engine Front Cover

This front cover houses the oil pump and water pump.
Timing Belt and Sprockets

Used to drive the camshaft on OHC engines
Timing Belt

- Provides a very smooth and accurate method of turning the camshaft - most have a service life of 50,000 miles (80,000 km), and should be replaced as part of regularly scheduled maintenance.

- Some belts are made of fiberglass-reinforced nitrile rubber:
  - some have a service life of 100,000 miles (160,000 km)
Timing Belt Sprockets

- Usually made of cast iron or aluminum
- Crank sprocket is keyed to the crankshaft snout
- Cam sprocket bolts to the camshaft
  - dowel pin may be used to position the sprocket correctly
- Timing marks must be aligned with specific points on the engine to properly time the opening of the valves
Belt Tensioner

- Some tensioners use both spring tension and hydraulic pressure.
- Hydraulic tensioner adjusts the belt tension with engine speed.
- At higher rpms, belt tension is increased to keep the belt from slipping or flying off.
- Spring-loaded wheel that keeps the timing belt firmly seated on its sprockets.
- Prevents the belt teeth from slipping the sprocket teeth.
OHC Engine

This engine uses a belt-drive for the camshaft and the auxiliary shaft.
Timing Belt Cover

- Protects the belt from damage
- Protects the technician from injury
- Made from sheet metal or plastic
- Tightly sealed at the bottom to keep road debris and water off the rubber belt
7. The **CRANKSHAFT GEAR** is keyed to the crankshaft snout, it turns a camshaft gear on the end of the camshaft.

8. An **AUXAULIRY CHAIN** is used to drive the engine oil pump, balancer shafts, and other units on the engine.

9. A **TIMING BELT** provides a very smooth and accurate method of turning the camshaft.

10. **HARMONIC VIBRATION** results from twisting and untwisting of the crankshaft.
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