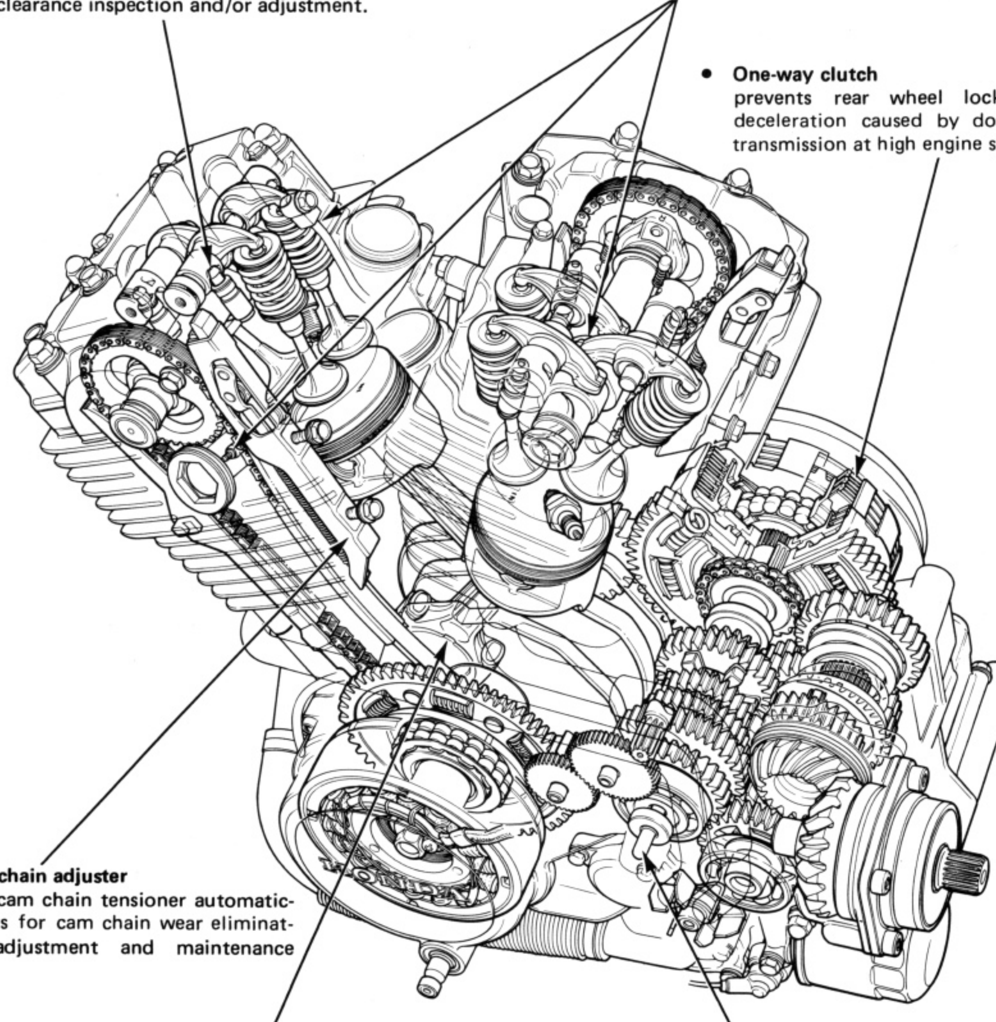
23. TECHNICAL FEATURES

THE HONDA V-TWIN ENGINE

1983 shall be known as the year in motor history that Honda introduced their line of V-twin engines.
Although the V-twin engine is not new to motocycling, Honda has refined the design more than any other manufacturer. With liquid cooling, hydraulic valve tappets, a one-way clutch that helps prevent rear wheel lock-up and an off-set crankshaft that is designed to virtually eliminate primary imbalance; Honda's V-twin engine can be considered a new design.

Characteristics

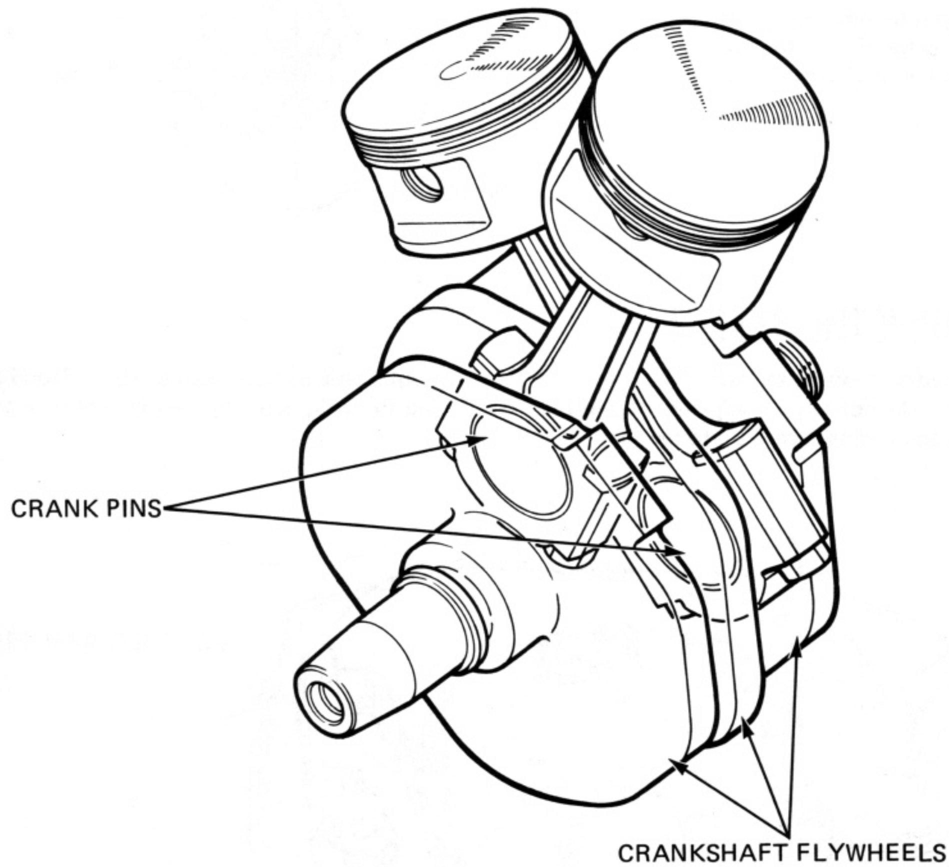
- **Hydraulic valve adjuster system** are used for the first time in a Honda engine. They eliminate the need for periodic valve clearance inspection and/or adjustment.
- **3 valves/2 spark plugs** Per cylinder provides highly efficient engine breathing, driveability and fuel economy.
- **One-way clutch** prevents rear wheel lock-up during rapid deceleration caused by down shifting of the transmission at high engine speed.



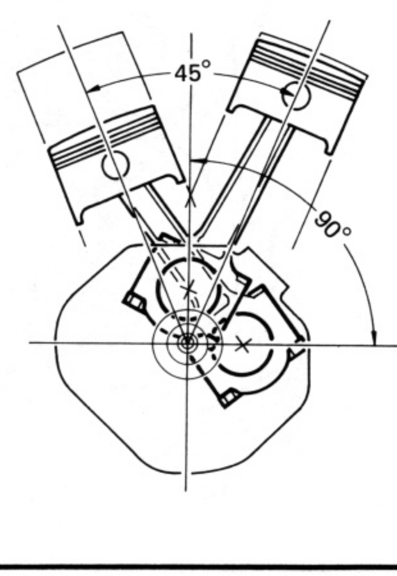
- **Automatic cam chain adjuster** The automatic cam chain tensioner automatically compensates for cam chain wear eliminating periodic adjustment and maintenance services.
- **Off-set dual-pin crankshaft** eleminates primary imbalance vibration.
- **Self-adjusted hydraulic clutch** Hydraulically assisted, the clutch requires a lighter lever pull compared to cable operated motorcycle clutchs.
  This system also provides a consistently smooth feeling when the clutch lever is pulled in and released. The hydraulic system automatically compensates for wear and the only maintenance check required is the hydraulic fluid reservoir level.

OFF-SET DUAL-PIN CRANKSHAFT

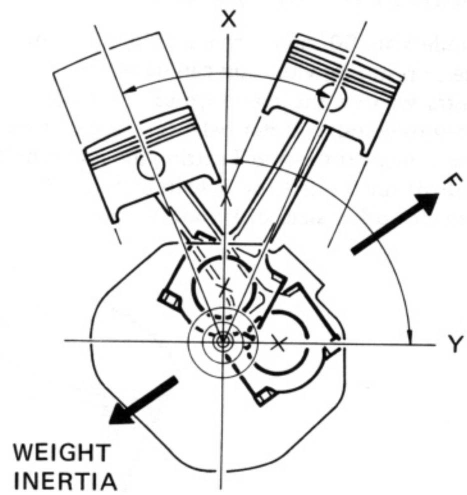
Unless its cylinders are 90° apart, the V-twin engine has an inherent primary imbalance.
The imbalance or resulting vibration can be severe.
Honda engineers wanted the compactness of a narrow V-twin with its cylinders only 45° appart, but without the primary imbalance. They ruled out counter-balancers because they would not contribute to the goal of compactness and light weight. So the engineers decided to try off-setting the crankshaft pins. They sucessfully developed a mathmatical formula to determine the amount of off-set needed for V-twin engines. The amount calculated for the VT750 just happens to be 90°. The off-set will be different for other sizes of Honda V-twins.



The front and rear crank pins are off-set 90° to each other. The connecting rods and pistons are inserted into the front and the rear cylinders which are 45° apart.

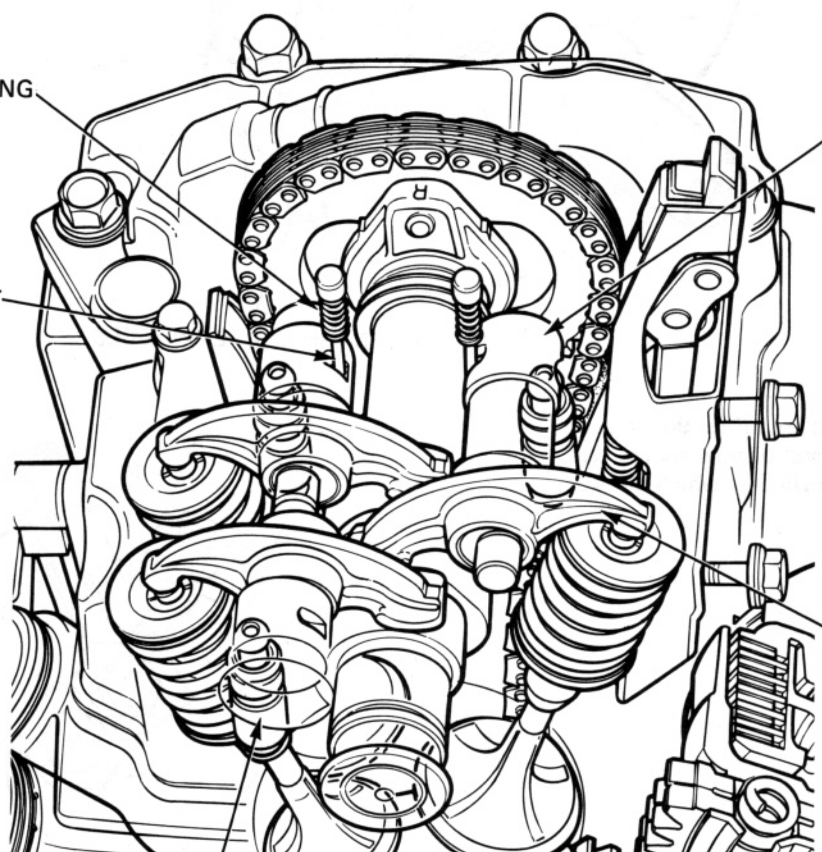


The primary force of inertia on a single cylinder engine occurs in the direction of the cylinder.
This causes the vibration that some single cylinder engines are known for. When applied to the V-twin engine the following occurs;
The primary force of inertia in directions X and Y combine to produce vector F. Vector F works in the direction between the front and rear crank pin centers.
To balance vector F, the crankshaft flywheels are precisely weighted in the opposite direction. The primary inertia produced by vector F and that of the flywheels oppose each other and cancel out overall primary vibration.



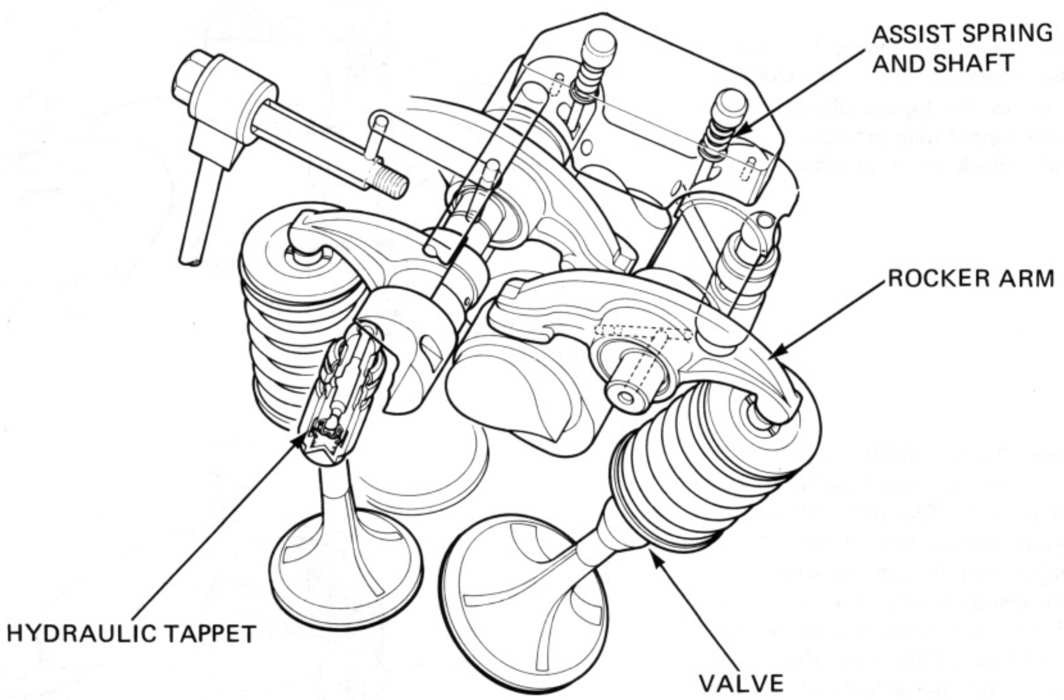
HYDRAULIC VALVE ADJUSTER SYSTEM

The engine is equipped with hydraulic valve tappets. This is the first time hydraulic tappets have been used in a Honda motorcycle engine. Hydraulic tappets do not require adjustment and help the engine to run quieter by keeping valve clearance at zero at all engine temperatures and engine speeds up to redline.

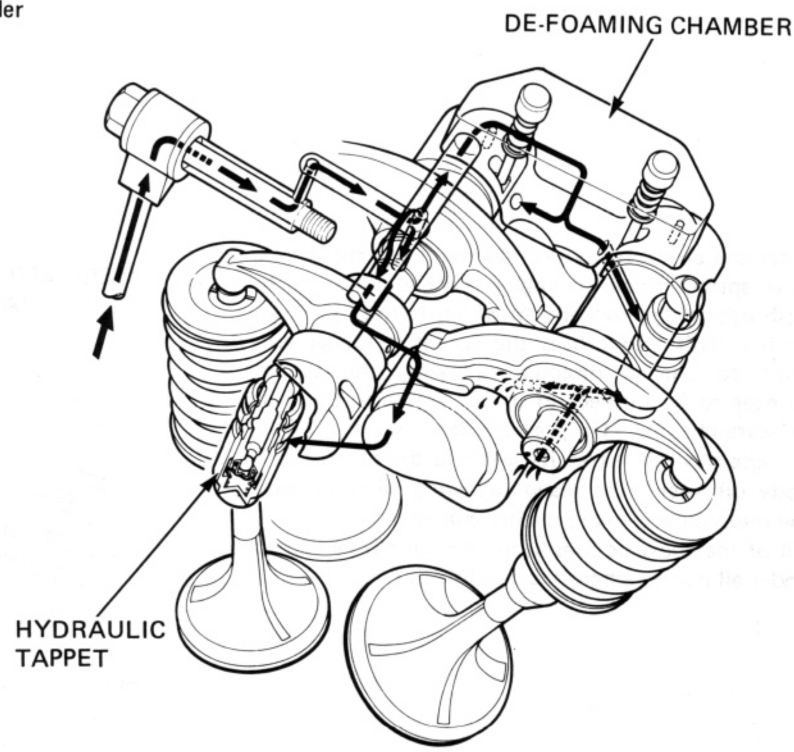


- **Construction**

A rocker arm is installed on an eccentric rocker arm shaft. An assist shaft and spring fit in a notch on top of the shaft. The hydraulic tappet fits in a notch in the bottom of the shaft. Together, they make the eccentric rocker arm shaft revolve to help maintain zero valve clearance.



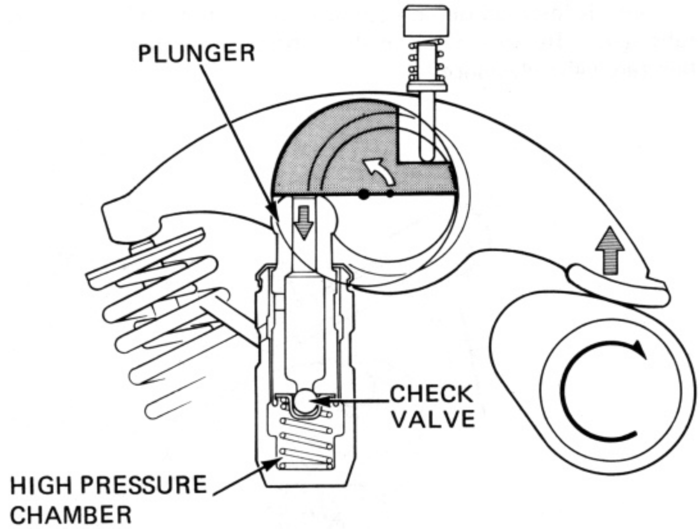
The tappets are continuously supplied with air-bled oil from the de-foaming chamber in the cylinder head cover where oil pass through.



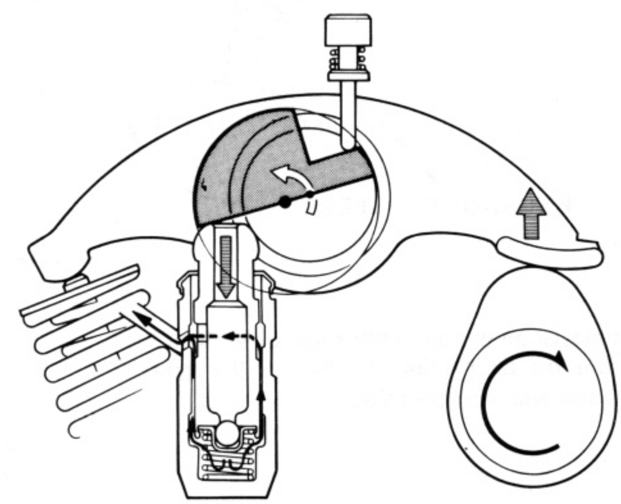
- **Operation**

When the camshaft lobe is not lifting the rocker arm, the tappet plunger is at rest. In this position its oil inlet hole aligns with the tappet body oil inlet hole. Oil enters the tappet reservoir through these holes.

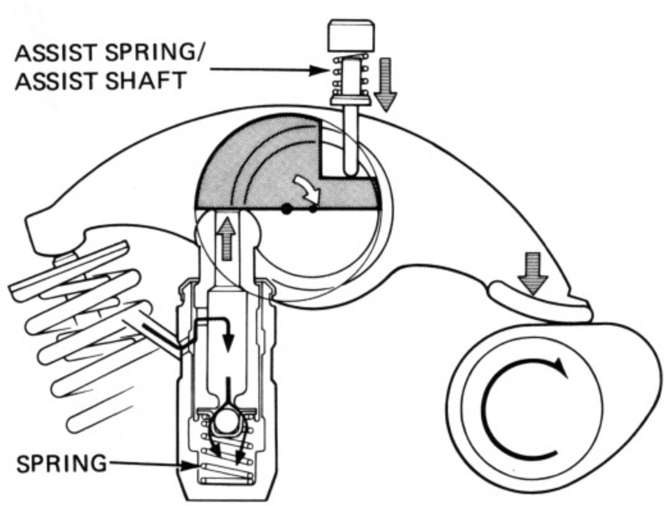
As the camshaft turns and lifts the rocker arm to open the valve, the eccentric roker arm shaft revolves. The shaft pushes the tappet plunger down and oil pressure in the tappet high pressure chamber increases causing the check valve to close.



As the cam lobe nears maximum lift, oil pressure in the high pressure chamber increases rapidly (because the check valve is closed). The high oil pressure keeps the check valve against the plunger. At the same time the rocker arm is pushing against the tappet plunger. This causes a very small amount of oil to leak out of the high pressure chamber between the plunger and body. This allows the plunger to absorb the shock from the effects of the cam lobe reaching maximum lift.



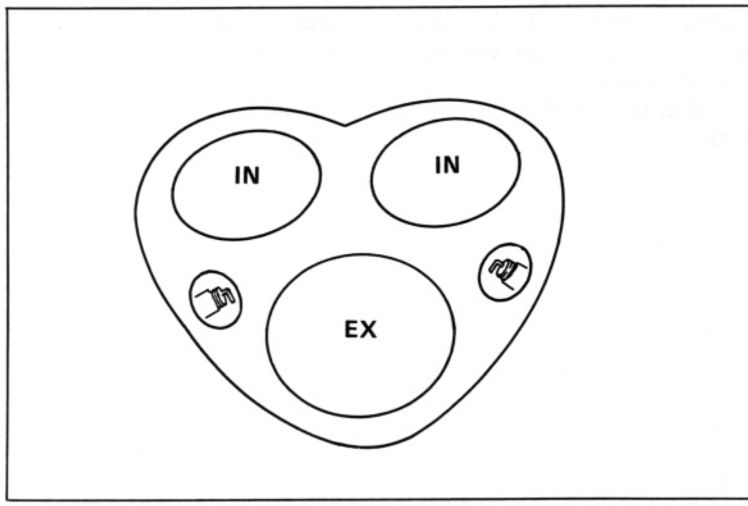
After the cam lobe passes maximum lift, the engine valve springs force the engine valve to close and to push against the rocker arm which follows the cam profile. This also causes the eccentric rocker arm shaft to change direction allowing the tappet plunger to be pushed up by the spring in the high pressure chamber. Oil pressure decreases as a result, the check valve leaves its seat and the plunger and body oil inlet holes realign allowing oil to re-enter the reservoir and high pressure chamber.
All of the above actions keep valve clearance at zero under all normal operating conditions.



3 VALVES/2 SPARK PLUGS

To have the appeal of a V-twin engine and also provide good low-speed driveability, plenty of engine torque and high fuel economy, a 3-valve/2 spark plug head design is used. There are 2 inlet valves of 31 mm diameter each and 1 exhaust valve with a diameter of 41 mm.

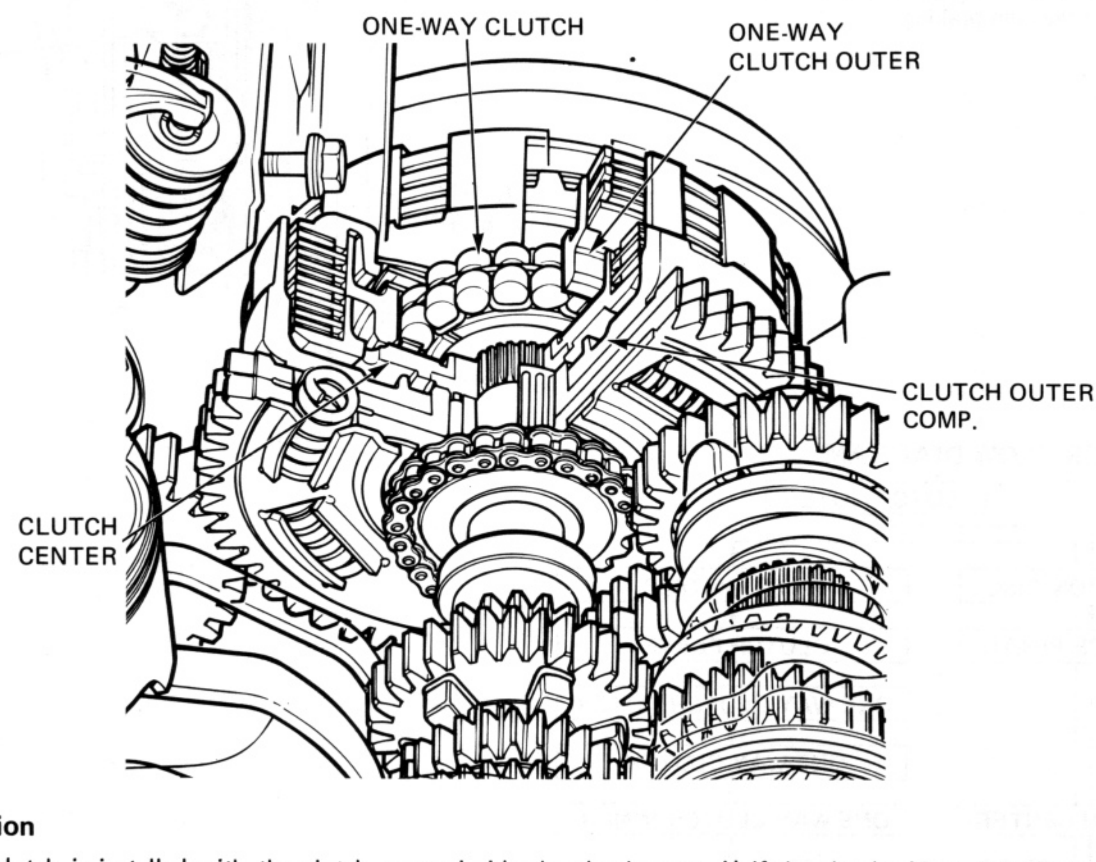
The spark plugs are located to provide the most rapid and complete combustion process: one on the left and one on the right side of the combustion chamber. This 2 spark plug design gives 30% better fuel economy and better driveability at low speeds when compared to a head with only one spark plug.



ONE-WAY CLUTCH SYSTEM

First time on a production motorcycle, this system has been proven on the race circuits of Europe in Hondas Gran Prix road racers.

Rear wheel lock up caused by rapid downshifting and the resulting high engine compression braking force; is prevented by the slippage of the one-way clutch.

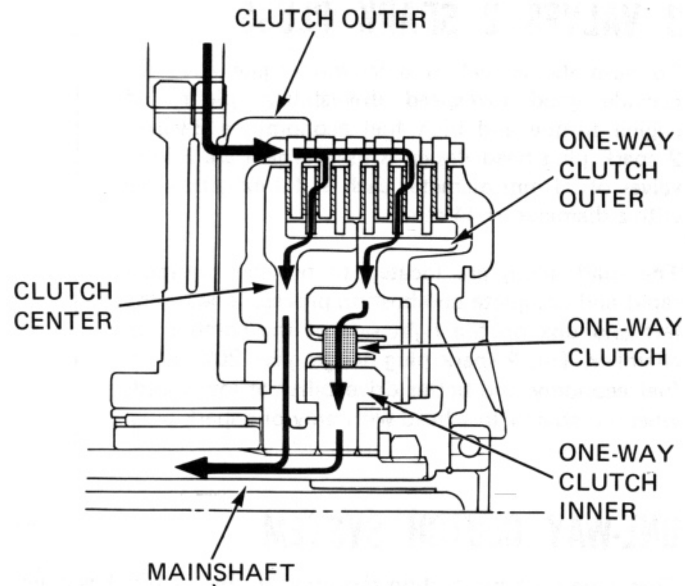


- **Construction**

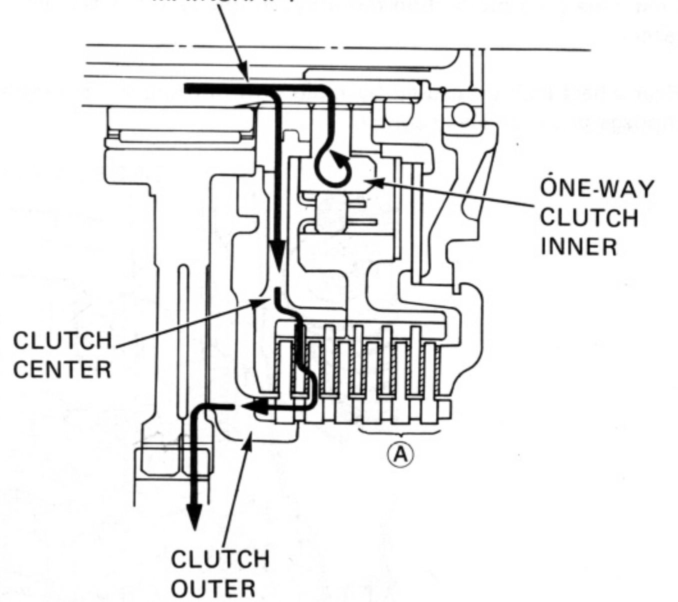
The one-way clutch is installed with the clutch center inside the clutch outer. Half the clutch plates are controlled by the one-way clutch. The one-way clutch allows those plates to slip when backloading force during deceleration might normally cause the rear wheel to lock-up.
Except for the one-way clutch, the primary driven gear/clutch assembly is a conventional design.

• Operation

During acceleration, cruising and deceleration, power is transmitted through the clutch in the normal manner:
Clutch outer → friction disc → plate → one-way clutch → mainshaft.



When there is a backloading on the clutch caused by the rear wheel nearing lock-up, the one-way clutch (A) will slip just enough to prevent the wheel from locking: without losing the benefit of maximum engine compression braking.



• POWER FLOW DIAGRAM