

VALVE OPERATING MECHANISM - SECTION 6-X

The valve operating mechanism can be a very troublesome source of engine noise if any one of several important manufacturing factors is neglected. The familiar tapping noise that is heard when some part of the valve mechanism is not functioning properly is actually the sound of a valve striking it's seat at too high a velocity. The speed at which the valve is traveling toward the seat decreases very rapidly as the valve approaches the seat. The camshaft is designed so that the velocity of the valve is slowed down to a very low figure for the last .006 of the cam motion. The velocity during this .006 of travel is low enough for the valve to seat quietly and consequently this portion of the lift curve is referred to as the quieting curve or ramp. A similar low velocity curve of .002 lift is used on the opening side of the cam to ease the sudden shock of opening the valve rapidly. When an engine warms up the exhaust valves expand and lengthen at a much faster rate than the cylinder block. It is therefore necessary, in a conventional engine with manually adjusted tappets, to allow enough clearance between the end of the valve and the tappet to take care of this expansion or the valve will not seat when the engine is hot and will burn very rapidly. If the clearance is excessive, because of wear or improper adjustment, the lift will be decreased and the valve will seat before it reaches the quieting curve of the cam and an objectionable noise will result. To eliminate the need for valve lash adjustments a hydraulic valve lifter is used in Cadillac engines. With this device the valve is lifted by a column of oil under a plunger in the tappet body. A spring keeps the plunger in contact with the end of the valve at all times. As the valve is lifted some leakage of oil occurs between the plunger and the body which is necessary to compensate for the expansion of the valve as it warms up. After the valve reaches its seat the spring raises the plunger in its body to take up the clearance that would have been generated by the plunger leaking down and draws more oil through the plunger and past the ball check valve and into the body. When the valve starts to open again the check valve closes and the cycle repeats itself. If during the time the valve is being lifted, the plunger leaks down more than .006 either from excessive plunger clearance or from a leaky ball check valve, the valve will seat before it reaches the quieting curve of the cam and it will be noisy. In most cases of valve noise the cause is a combination of troubles and is not due to the hydraulic lifters alone. A loose valve guide or a seat that is not concentric with the guide will allow the valve to strike one side of the seat too soon and result in a noise. If the guide or the runout are too far out of limits, a hydraulic lifter with a slower leak-down time will fix the trouble and the hydraulic lifter will be blamed when it is not at fault. If the contour of the cam is not held to specifications and the quieting curve is less than .006 in height, noisy operation may also occur. The hydraulic valve lifters are very sensitive to dirt because a small particle can cause leakage at the check valve and can stick the plunger in the body and fail to take up it's clearance with the valve. It is therefore particularly important that all engine parts at assembly are kept free from loose metallic particles, and free from burrs that might get into the oil supply after the engine has been run, if trouble with the hydraulic lifters is to be avoided.