

ENG-07, Balance Shafts - A Little History and Why 944s Use Them

One of the complaints that many 924 owners had about their cars were related to vibrations. Large in-line four cylinder engines inherently produce large second order harmonic vibrations. To solve this problem, Porsche elected to use a balance shaft system on the 944. The balance shaft system was actually invented by Frederick Lanchester, an English inventor, in the early 1900's. However, it was Mitsubishi that eventually patented the idea which they called the "Silent Shaft" system. Porsche developed their own balance shaft system for the 944 apparently using three bearings instead of the two employed by the Mitsubishi system. However, Porsche discovered that the Mitsubishi system worked better. So, Porsche paid Mitsubishi a royalty of 6 - 8 US dollars per car to use the "Silent Shaft" system.

Each balance shaft has two counterweights which resemble small hockey pucks with the shaft running through them. The two counterweights are about an 1-1/2 inches apart (or approximately 4 cm). The section of the shaft between the counterweights is machined for the main balance shaft bearing. The balance shaft turns the counterweights at twice the speed of the engine. With one located high on one side of the engine and the other low on the opposite side of the engine, the balance shafts turn in opposite directions from each other and balance the vibrations of the large spinning mass inside the engine.

By the way, Frederick Lanchester is credited with a number of very significant inventions including disc brakes which he invented in 1903.

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