Gearing Up for High Performance:
Stealth and Helical Gears

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Design engineers are continually looking to increase throughput and production requirements. In the case of servo manufacturers, the need was for motors that could perform more complicated moves and produce higher torques and speeds. With the development of new micro electronic and magnet technology, servo manufacturers were increasing the capabilities of their motors. The market needed a gearhead that would be able to match these requirements. The Stealth Helical Planetary Gearhead was designed for the needs of today's demanding servo applications. The idea behind the Stealth is to accept high-input speeds, deliver high torque and torsional stiffness, and to run quietly. The design features that support these benefits are explained in detail below.

Helical Gears

What is a helical gear? The tooth of a helical gear is not parallel to the gear axis; it is set at an angle. Since the surface over which the tooth is made is cylindrical, the tooth takes the shape of a helix.

As the gear tooth is diagonally positioned, it is effectively larger when compared to a straight cut spur gear. This, along with an inherent higher gear tooth contact ratio, results in greater load (torque) carrying capability. In addition, as a helical gear meshes with another helical gear, there is a gradual engagement/disengagement of the teeth as they rotate. The contact line of the meshing teeth progresses diagonally across the face from the tip at one end to the root of the other reducing vibration and noise. Illustration (a) in Figure 1 shows a helical gear tooth contact line compared to a straight spur tooth (illustration (b)).

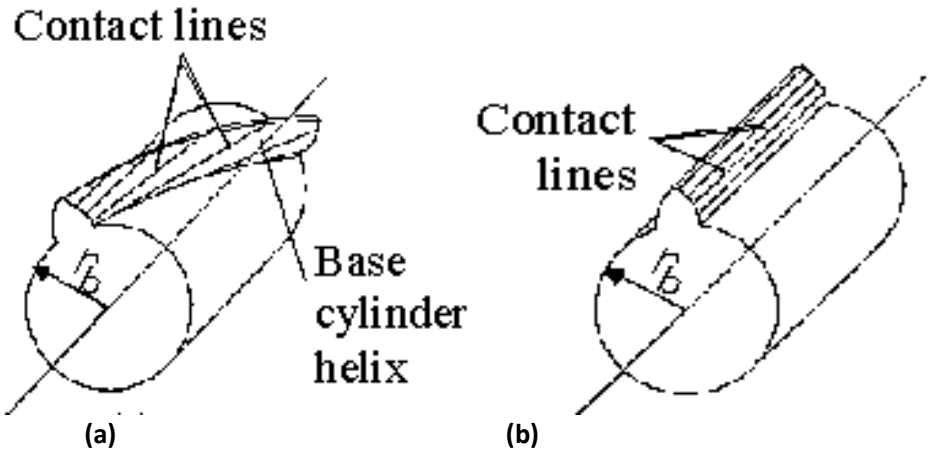

Figure 1 – Helical gear tooth pattern versus straight spur tooth

Helicrown

The "helicrown" gear tooth was developed to reduce noise without sacrificing strength. Since most vibration occurs at the entry and exit points of a gear tooth, metal was only removed from these areas. The maximum amount of contact still occurs across the face of the gear tooth, but the tooth impact is decreased during the tooth's engagement. Helicrown provides a balance between torque, speed, and noise in the gearhead's performance.

Integral Ring Gear

The gear train of a planetary gearhead consists of a sun gear, planet gears, and a ring gear as shown in Figure 2. Parker integrates the ring gear directly into the gearhead's steel housing rather than having a separate ring gear component that is press fitted. Cutting the ring gear directly into the housing allows for larger bearings and gears delivering maximum torque and stiffness in a minimum package.

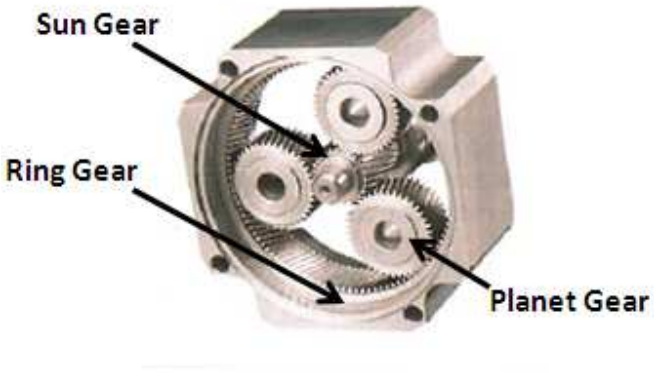

Figure 2 – Stealth planetary mid-housing

Plasma Nitriding

Plasma, or ion, nitriding is a method of surface hardening using an electrical discharge to introduce elemental nitrogen to the gear surface. As the nitrogen concentration increases toward the gear surface, very fine precipitates are formed, distorting the lattice structure of the material and increasing its hardness. A surface hardness of 65 Rc is achieved while at the same time maintaining a core hardness of 35 Rc. The result is a gear tooth with excellent wear characteristics at its surface and with a softer core, providing excellent shear strength capability that together increase the gear's life expectancy

Figure 3 - A unique characteristic of Parker's manufacturing capabilities is our in-house plasma nitriding equipment

Parker's Stealth planetary gearheads are designed for today's demanding servo applications. For more information, please visit www.parkermotion.com.