



Engineering Patents II: Case Study of a Ball Bearing Patent Application

An Online Continuing Education Course for Engineers

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**Engineering Patents II:
Case Study of a Ball Bearing Patent
Application**

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Introduction

Previously published course "Engineering Patents" examines patents, the patent application process, and a patent granted to a U.S. corporation to improve one of its products. This course examines a patent application that reveals another side of the patent process.

A patent is a document issued by the government that gives the engineering applicant exclusive rights to an invention for a period of 20 years. The invention must be something that is new and useful to society. An invention that is obvious to a person with average skill in a given field is not patentable. Patent laws give individuals and corporations incentive to develop their innovative ideas for their own benefit and for the benefit of others.

There are three types of patents; utility patents, design patents, and plant patents. Engineering patents usually fall into the category of utility patents. Utility patents involve materials, machines and components, and manufacturing parts and processes. Design patents involve only the appearance of an article. Plant patents, as the name suggests, are given to those that reproduce a new variety of plant.

Background

There has been a long standing debate among anti-friction bearing engineers as to what type of bearing to use in an application. This course deals with one of the arguments by examining an engineering patent request that suggests the use of angular contact ball bearings to replace tapered roller bearings in a power transmission product.

Angular contact ball bearings are similar to commonly used radial ball bearings except for the alignment of the balls and rings. Radial ball bearings have the balls and rings aligned to support radial loads. Radial loads act perpendicular to the bearing axis of rotation. Angular contact ball bearings have the balls and rings aligned so that the line of contact is at an angle to the perpendicular. They are used to support both radial and thrust loads. Thrust loads act parallel to the bearing axis of rotation. See figure 1.

Tapered roller bearings have the roller to ring contact line act at an angle to the perpendicular similar to angular contact ball bearings. Tapered roller bearings, like angular contact ball bearings, support both radial and thrust loads. See figure 2.

Angular contact ball bearings operate with virtually pure rolling between the balls and rings. Tapered roller bearings, under load, create forces that act to "squirt" the roller large end against the inner ring (cone) flange face causing frictional losses that don't exist in angular contact ball bearings. See figure 3.

Ball bearings have a much lower spring rate (load vs. deflection) than tapered roller bearings. The contact between balls and rings starts out as a point and, as the load increases, evolves into an ellipse. The contact for tapered roller bearings starts out as a line and, under increasing load, changes into a larger rectangular shape. The spring rate of tapered roller bearings is "orders of magnitude" greater than that of ball bearings.

The following pages describe the above mentioned patent application that was submitted for a gearshaft bearing arrangement. Included is a discussion of four existing patents that were selected as "prior art". Prior art are existing patents that are similar to the one being applied for. They can be used by the patent applicant as reasons why his patent should be allowed or they can be used by the Patent Office as reasons why the patent should be denied.

Figure 1

