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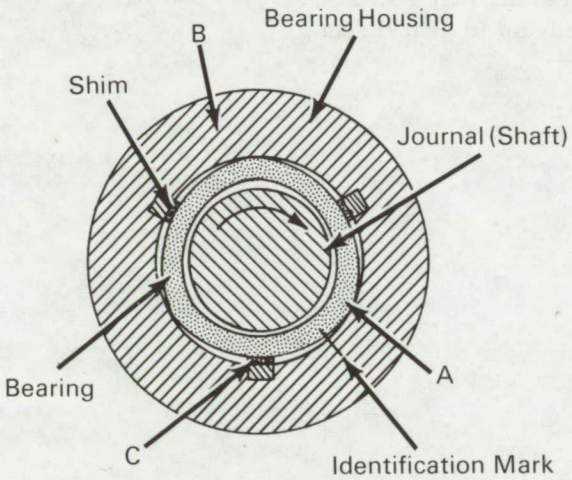
Brief 68-10441

NASA TECH BRIEF

Low Cost Technique for Fabricating Lobed Bearings



Lightly loaded rotors running in gas lubricated, plain journal bearings are inherently unstable. Tangential film forces, which predominate under light load conditions, cause the rotor to precess or "whirl" about the bearing center. This is a self-excited instability which produces an outward spiraling of the rotor when speed is increased. If contact of rotor and bearing occurs, destructive seizure may result.

A number of self-acting bearing designs which have been studied exhibit somewhat stable operating characteristics. These designs shape the bearing surface to create artificial fluid-film wedges in the absence of any applied radial load, and radial restoring forces are generated which tend to keep the rotor from whirling.

The lobed bearing shows promise of providing stable operation. Lobed areas formed on the bearing act like a pump when the rotor turns. The pressure distribution that results is similar to that obtained in a hydrostatic gas bearing. Lobed bearings, however, are usually expensive to manufacture.

This new technique replaces comparatively expensive internal machining methods for producing lobed bearings. Conventional methods of manufacture require accurate off-center grinding of the inside diameter of a bearing in a housing at various arc lengths depending on the number of lobes required.

The new low cost technique utilizes shims to create the lobes in the bearing. The fabrication technique is as follows:

1. Bearing "A" is assembled into housing "B" by subcooling bearing "A" and/or heating housing "B", and inserting bearing "A" into housing "B". (Housing "B" at this time does not have any shims on its inside diameter.)

2. Bearing "A" is machined in place to a predetermined inside diameter and "match-marked" with the housing.

3. Bearing "A" is removed from its housing by subcooling and/or heating the assembly.

(continued overleaf)

4. Shims are placed around the inside diameter of the housing at locations where lobes are desired, and tack-welded in place. Shims 1/8" wide were used in 1-1/2" diameter bearings. The thickness of the shims depends upon the lobe height desired.

5. Bearing "A" is again assembled into the shimmed housing "B" by subcooling bearing "A" and/or heating housing "B".

6. When the bearing and housing have reached equilibrium conditions of temperature, inward displacement of the bearing metal above the shims produces the lobes. An inside diameter trace can be made of the resultant contour. The lobe contours produced will depend upon the thickness of the shims and the physical properties of the bearing housing, shim stock, and bearing materials used. Rotors 1-1/2 inches in diameter by 1-1/2 inches long were tested in the lobed bronze bearing at speeds up to 12,000 rpm with satisfactory performance.

Notes:

1. The simplicity of fabrication has reduced costs by a factor of 30.
2. No additional documentation is available for this invention.
3. Technical questions concerning this invention may be directed to:

   Technology Utilization Officer
   Lewis Research Center
   21000 Brookpark Road
   Cleveland, Ohio 44135
   Reference: B68-10441

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: Frederick T. Schuller
(LEW-10296)