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NASA TECH BRIEF

Improved Design of Item in High Speed Rotating Machinery

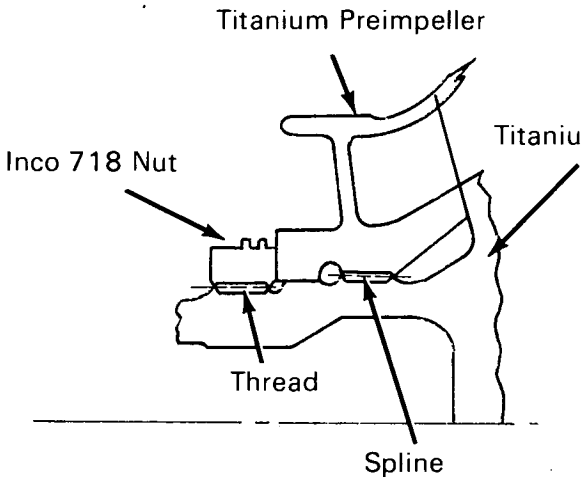

Figure 1 (Original Design)

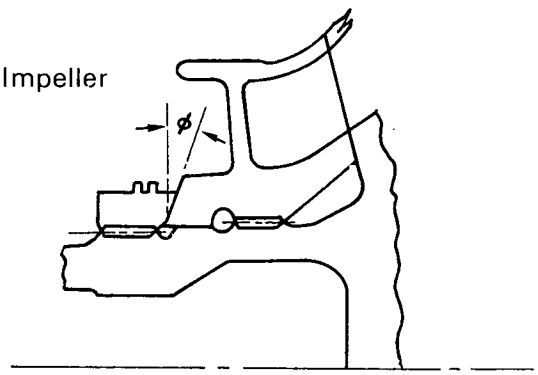

Figure 2 (Improved Design)

Clamping and alignment problems in high speed rotating machinery are the result of axial Poisson's contraction of the preimpeller hub. With the original design it was not possible to preload the preimpeller nut sufficiently to compensate for the contraction. This resulted in axial and, therefore, radial looseness of the preimpeller with respect to the impeller. The improved design, however, is able to compensate for the contraction by utilizing the greater centrifugal radial growth of the preimpeller hub with respect to the impeller and nut at operating speed. The improved design results in axial tightness and radial piloting of the preimpeller and promises to provide a solution to clamping and alignment problems present in such high speed rotating equipment as turbopumps, jet engines, axial pumps.

The new design of the nut and preimpeller hub incorporates an angle ϕ chosen such that, when combined with thermal effects, the radial growth of the preimpeller hub compensates for its axial Poisson's contraction. The improvement is significant in that it employs the centrifugal force achieved at operating speed to effectively load the preimpeller. Thus, force vectors generated at operating speed maintain an axial tightness and radial piloting of the preimpeller not possible with mechanical locking or loading devices.

Note:

No further documentation is available. Inquiries may be directed to:

Technology Utilization Officer
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Huntsville, Alabama 35812
Reference: B69-10373

(continued overleaf)

Patent status:

No patent action is contemplated by NASA.

Source: J. A. Dietrich of
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