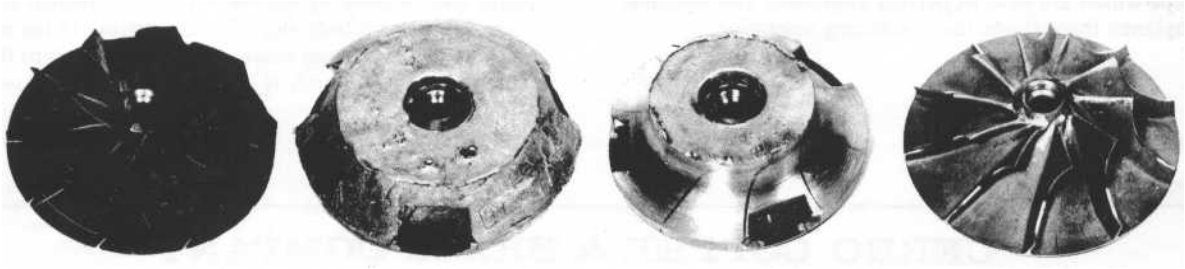
CERRO* Alloys Support Thin Sections for Machining

Machining Fine Tips of Rotor Blades Poses Support Problem

Operating at 40,000 rpm at elevated temperatures requires a high degree of uniformity in aerodynamic and balance characteristics of compressor and turbine rotor blades. Stratos Division of Fairchild Engine and Aircraft Company solves the demanding problem of supporting such components for finish-machining by using CERROBEND Alloy as described below. The rotors, which are milled from steel, titanium, or aluminum forgings, have thin blades that are bent over a mandrel to an airfoil shape- Final machining, which involves several difficult contouring cuts, requires positive supporting of these thin sections.

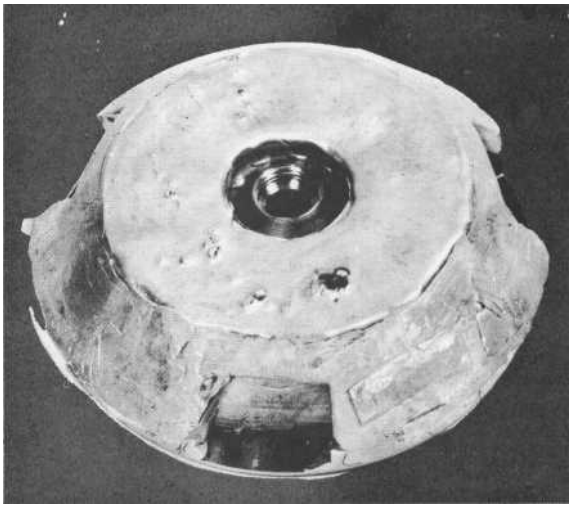
CERROBEND© Provides Ideal Properties As Workholder Device

Four stages of manufacture of the rotor blades are shown below. Left to right are: the milled rotor with blades bent to shape; same rotor fully encased in solid Cerrobend; the machined rotor prior to removal of the supporting alloy; and the finished part after melt-out of the Cerro metal. Cerrobend, one of the eutectic (sharp melting point) alloys, melts at 158°F. Its non-shrinking property makes it ideal for workholding devices. A holding tank of hot (below boiling point) water is all that is required to keep the alloy molten. The metal pours easily at safe temperatures and solidifies within a few minutes.

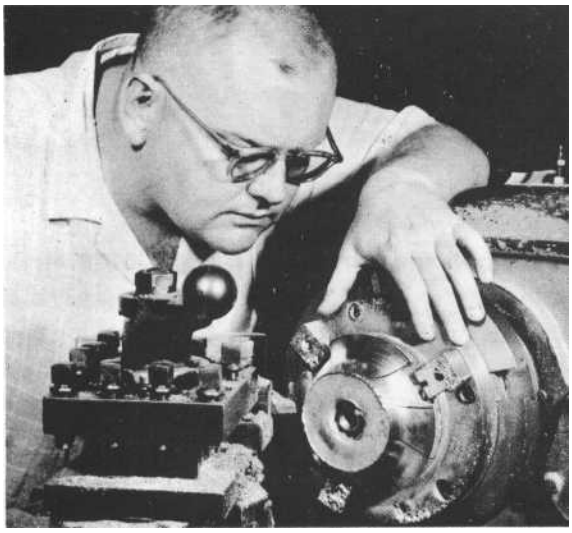


Method of Application

Molten alloy is dipped from holding tank in rear and poured into a jig around the rotor being invested for machining- Note easy, safe handling of low-temperature-melting alloy.



The workpiece shown wholly invested in alloy- Although chilling improves the grain structure of bismuth alloys, in this instance the material is allowed to cool in air to achieve better damping properties. Alloy expands slightly on cooling to provide tight workholding fit.



Contour machining proceeds as with a solid casting or forging- Black lines are the machined rotor blade tips which are held in perfect alignment and dynamic balance throughout the machining operation.

Removal of the alloy is accomplished here by steam line discharging into an odinary steel bucket- Removal could also be done by hot water bath. Individual parts come clean, with only slight hand scouring in the case of anodized aluminum rotors. Lighter metal chips float on molten alloy which is then reclaimed for reuse.

CERRO COPPER & BRASS COMPANY