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LASER REPAIR METHOD FOR NICKEL BASE SUPERALLOYS WITH HIGH GAMMA PRIME CONTENT



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ABSTRACT

A laser repair method for a high gamma prime content Ni base superalloy substrate surface (12), with gamma prime content in the range of at least about 30 volume %, conducts the repair at ambient temperature without preheating the substrate surface (12) and by controlling processing parameters to avoid cracking of the resulting weld bead during and after welding. The laser beam (14), operating in a power range of about 50 – 10000 watts per centimeter, is focused (18) away from the substrate surface (12) to provide a laser spot (20) in the size range of about 0.03 – 0.2". A relative movement (30) between the substrate surface (12) and the laser beam (14), for example at a rate in the range of about 1 – 100 inches per minute, provides an interaction time of no greater than about 10 seconds between the laser beam (14) and the substrate surface (12). Concurrently, a repair alloy powder (22) is deposited in the laser beam (14) to melt and fuse the repair alloy powder (22) into a molten repair alloy deposited on the substrate surface (12).

Figure 1