

SURFACE OXIDE WELD PENETRATION ENHANCEMENT METHOD AND ARTICLE

ABSTRACT

A method for welding iron-based or nickel-based superalloy assemblies (12, 14) into a unitary article. First, the assemblies (12, 14) are heated in an air atmosphere, at a rate suitable to minimize geometric distortion, to a temperature in the range of about 1400F (760°C) to about 2000°F (1090°C) to form an oxide layer (24) on the surface of the assemblies (12, 14) and optionally as a pre-weld solution heat treat. The temperature of the assemblies (12, 14) are then held in a range of about 1400°F (760°C) to about 2000°F (1090°C) for a time sufficient to form an oxide layer (24) of sufficient thickness on the surface of the assemblies (12, 14) and optionally to solution the assemblies (12, 14). The assemblies (12, 14) are then cooled to ambient temperature at a rate sufficient to avoid precipitation of unwanted metal phases at a rate sufficient to maintain dimensional stability. The oxide layer (24) is then removed from at least the faying surfaces (16, 18) of the assemblies, but not from the face side (20, 22) of the assemblies (12, 14). The faying surfaces (16, 18) of the assemblies (12, 14) are then cleaned. The assemblies (12, 14) are then welded using a GTA welding procedure to form a unitary article. The article is then resolutioned at an appropriate temperature for an appropriate period of time, both of which are dependent on the type of superalloy(s) that is present in the welded article and the desired properties. The article is then optionally age heat treated at an appropriate temperature for an appropriate period of time, both of which are dependent on the type of superalloy(s) that is present in the welded unitary article.

Fig. 1