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Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

[Continued on next page]

(54) **Title**: ARTICLE AND METHOD OF MANUFACTURING RELATED TO NANOCOMPOSITE OVERLAYS

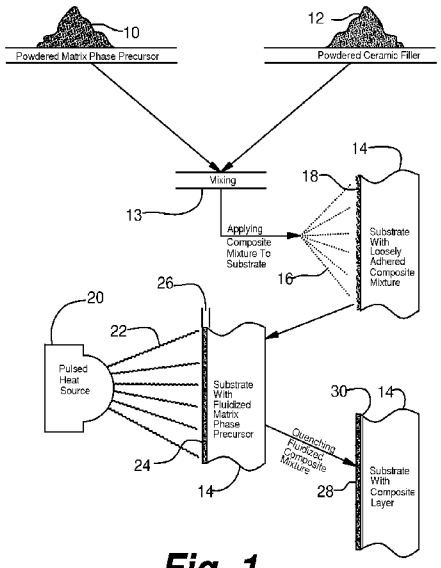


Fig. 1

(57) **Abstract**: Composite layers are formed on substrates, particularly heat sensitive substrates. A uniform composite mixture is prepared from powdered nanoscale ceramic phase particulates and a particulate matrix phase precursor that contains a fusible matrix former. The composite mixture is applied to the substrate surface where it forms a composite mixture layer that is thin relative to the substrate. The composite mixture layer is subjected to a rapid high flux heating pulse of energy to fluidize the fusible matrix former, followed by a rapid quenching step that occurs at least in part because of heat transfer to the substrate, but without significantly damaging the overall temper properties of the substrate. The nanoscale ceramic phase is present in the composite layer in an amount that is greater than its percolation threshold, so the resulting fused composite layer does not tend to flow or sag while the matrix former is in the fluid state. Also, the grain size of the matrix is minimized by the presence of the nanoscale ceramic phase.

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