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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))*

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- *without international search report and to be republished upon receipt of that report (Rule 48.2(g))*

(54) **Title:** SPLIT-PASS OPEN-DIE FORGING FOR HARD-TO-FORGE, STRAIN-PATH SENSITIVE TITANIUM-BASE AND NICKEL-BASE ALLOYS

(57) **Abstract:** Split pass forging a workpiece to initiate microstructure refinement comprises press forging a metallic material workpiece in a first forging direction one or more times up to a reduction ductility limit of the metallic material to impart a total strain in the first forging direction sufficient to initiate microstructure refinement; rotating the workpiece; open die press forging the workpiece in a second forging direction one or more times up to the reduction ductility limit to impart a total strain in the second forging direction to initiate microstructure refinement; and repeating rotating and open die press forging in a third and, optionally, one or more additional directions until a total amount of strain to initiate microstructure refinement is imparted in an entire volume of the workpiece.

