



Centro Italiano Ricerche Aerospaziali

Summary:

Robotic system for the manufacturing of CFRP structures through continuous winding, wet or dry, consisting of:

- 1) Robotic head with infinite rotation of the deposition eye, to feed helical winding trajectories.
- 2) Creel with separate tows to feed hoop trajectories in parallel winding.
- 3) Deposition mandrel.

Benefits:

This system is aimed at the manufacturing by automated winding of CFRP products characterised by very complex shapes (e.g., single or double curvature, “T” or “Y” shapes), allowing to overcome some limits of the technology based on the traditional winding.

The system is particularly effective for the manufacturing of interlaced Grid Structures, axi-symmetric or not.

Robotic system for the automated deposition of CFRP structures supported by an infinite rotating eye and a creel for parallel winding

Problem addressed:

Traditional Winding processes applied to the production of Grid Structures have severe limitations, essentially caused by the inability to continuously interlace helical ribs with separate hoop ribs. In addition, the winding trajectories around peripheral pins, which normally delimit the helical ribs, are rather complex and, in most cases, are not feasible, because the head, typically, cannot closely approach the pins and is not provided with infinite rotation of the deposition eye.

Proposed use:

The patented process is mainly proposed for the manufacturing of Grid Structures for space and aeronautical applications and is currently being used by AVIO, under license agreement, for the serial production of the Interstage 2/3 of the space launcher VEGA C. Other than interstages, this kind of process is especially suitable for the production of satellite Central Tubes, Boom for deployable antennas, Conical Adapters and Fairings for space launchers, Fuselage sections.

Technology overview:

The patent is part of the automated production framework devoted to highly efficient CFRP structures, ranging from small-scale to large-scale items for aerospace applications. The patent allows to bring together versatility and effectiveness of the manufacturing process of rather complex structures, reducing hardware and process costs.

Reference project:

PRORA- Low Weight Low Cost Fuselage
ASI - Composite Grid Stiffened Structures fase B1
ESA - VEGA C Interstage 2/3
ESA - ARTES 5.1 CFRP Grid Tubular Structures
MOD- Conical Grid Space Structures with Embedded FOS Capability
PRORA- USV Grid
PRORA- Large Reflector Boom

Intellectual property Information:

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