Overcoming Design Limitations in 3D Weaving: Principles and Applications of the DIFA Machine for Complex Textile Structures

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Abstract

Three-dimensional (3D) weaving using VÚTS technology has proven to be a transforma ve method for crea ng complex tex le structures with excellent proper es. This abstract presents a new 3D weaving technique that overcomes the limita ons of exis ng methods and enables the produc on of 3D tex le structures with increased design flexibility. The innova ve approach is embodied in the new DIFA weaving machine and is characterised by a unique interlacing method - the interlacing of spacer (distance) yarns, the integra on of advanced mechanisms to achieve high densi es of the yarns forming the 3D structure, and a complex, variable geometry of the resul ng 3D structure - all achieved with high produc vity of the weaving process itself. The paper describes the basic principle of this new 3D weaving technology, including its unique ability to produce special 3D shapes. Other parameters and advantages of the technology are also presented in comparison with conven onally woven 3D tex les. Finally, the presenta on explores the poten al applica ons of these advanced 3D woven structures in various fields, such as the rescue and defence sector, medical devices, construc on, and leisure products, highligh ng the transforma ve impact of this new 3D weaving technology on the future of tex le engineering and materials science.

Keywords: 3D Weaving Technology

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