Process Engineering | Technology Offer

Force constant adaptation of braided sleeving in the automated production of braided components

Field of application

Tubular braids made of fiber-reinforced composites are widely used in different industrial sectors, not least in the automotive industry. When producing tube-like components by overbraiding a mandrel, the novel pressure roll mechanism for braiding machines allows narrower angles of curvature or larger cross-sectional changes to be implemented automatically.

State of the art

Commonly braiding rings are used in the field of automated braiding to produce fiber-reinforced components. The braiding ring guides the braided sleeve as close as possible to the mandrel in order to ensure a high level of component quality.
Adaptive braiding rings can be used to create straight, tube-like braids with varying cross-sections along the longitudinal axis. The diameter of the braiding ring is adapted to the mandrel's cross-section so that the deflection point of the fiber is always as close to the component axis as possible.
However, the state of the art doesn't provide the technology for a fully automated braiding process when overbraiding curved mandrels. Because the braid is stretched along the outer component radius and released at the inner component radius due to the different overbraiding velocities, it often becomes necessary to manually press the braid against the mandrel surface in order to avoid the undesired relaxation of the braid within the radius of the curvature. This method, however, involves high personnel costs and is not suitable for serial production as the result cannot be reproduced accurately.

Innovation

The Institute of Aircraft Design (IFB) at the University of Stuttgart developed a flexible pressure roll mechanism which automatically presses the braided sleeve against the mandrel, so that stretching or releasing is prevented when using mandrels with curvatures or larger cross-sectional changes.
Rotating, flexibly mounted pressure rolls are fitted to a braiding ring plate. The flexible mounting allows the pressure rolls to adapt to the mandrel's positioning (e.g. inclined position) and to changes in the cross section. They exert a constant and precisely defined force on the braid and thereby press it against the mandrel. Since the pressure rolls rotate on the braided sleeve, no abrasion damage occurs.
As part of the automated process, the robot control of the braiding machine coordinates the movement of the pressure rolls. This significantly improves the braiding of components with a variable cross-section and curvatures so that manual intervention is no longer required.

Your benefits at a glance

- ✓ Fully automated braiding process, also for components with curvatures and cross-sectional changes
- ✓ Improved reproducible braid quality
- ✓ Integration of the pressure roll control with the robot controller of the braiding machine.
- ✓ Flexible mounting of the pressure rolls enables adjustment to the radius of the curvature, thereby preventing stretching or relaxation of the braid
- ✓ Simple, fast and flexible integration into existing braiding machines

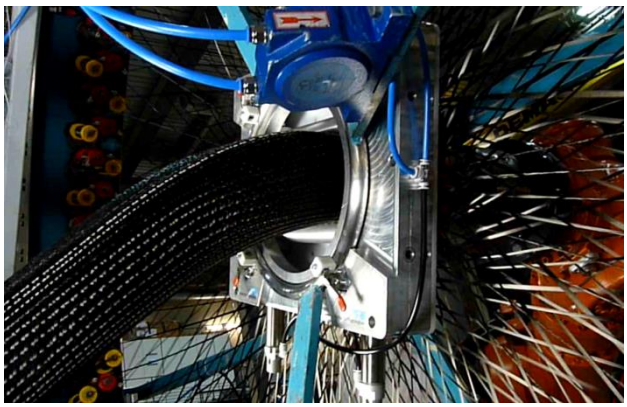

Figure 1: Pressure roll mechanism integrated into a radial braiding machine

Technology transfer

Technologie-Lizenz-Büro GmbH is responsible for the exploitation of this technology and assists companies in obtaining licenses.

Patent portfolio

DE 10 2014 212 063 and EP 15731519 pending.

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