DEVELOPING A SYSTEM FOR SEWING HEAVY DISK-SHAPED TEXTILES

Persons in charge: M. Märker, Dipl.-Ing.
J. Födisch, Dipl.-Ing.

A device for sewing disk-shaped technical textiles was developed in 1999, on behalf of and in cooperation with the Dresden University of Technology, Institute for Textile and Apparel Technology, Department of Making-Up Technology. This technological project was aimed at introducing seams into the material, in a targeted manner, in order to stabilize the fabric layers and improve the strength of disk-shaped composites, while protecting them against delamination. The stitches must be of a high position accuracy. Circles, spirals and similar centre-oriented seam shapes must be sewn using variable adjustable parameters such as stitch length, seam spacing, and direction of sewing.

To solve this issue, Cetex gGmbH developed and manufactured the CNC controlled "PRN 500 Programmable Circular Sewing Device".
The sewing device consists of a sewing unit and a control cabinet. A stiff box-type frame made of light-metal assembly sections provided with a placed-on table plate accommodates the driving units ensuring the motions of the sewing material head, as well as the sewing machine and its drive motor. According to the selected principle, the material to be sewn is centred on an axle ("clamping head"), like a grinding wheel, and fastened in a removable manner.
The guiding of the material to be sewn takes place in two simultaneous motions, one rotational motion and one shifting motion (cf. Figure 1). The clamping head and the material to be sewn are rotated via a servomotor (c-axis). Simultaneously, the clamping head and the material are displaced laterally via a second servomotor (x-axis), vertically to the normal transfer direction of the sewing machine. To change the material to be sewn, the material is moved out of the area of the sewing machine and into a change position, via the x-drive. Subsequently, the material may be precisely stacked outside the sewing machine according to the thread arrangement determined by the plastics technology applied, and fixed.

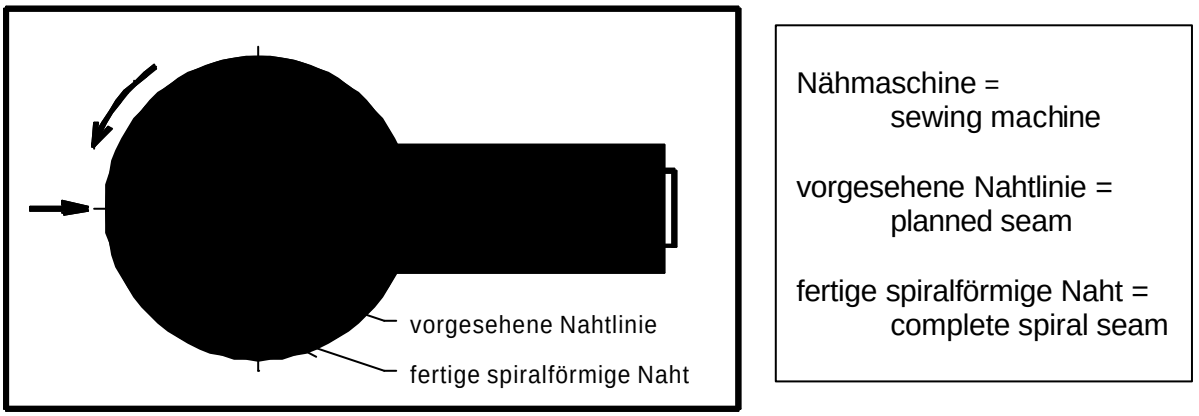

Figure 1 : Principle of action of the sewing installation.

A single-needle double saddle stitch sewing machine was adapted to the conditions of the sewing device and used for the testing. The control cabinet accommodates the control equipment. Instruction devices and a menu-driven operator control panel allow for operation, supervision, help, parameter input, and machine safety.
The control concept includes a system for the software-driven determination of the x-c-positions for each individual stitch, taking into account the set parameters (seam shape, stitch length, seam spacing) as well as the thickness of the material to be sewn.

To obtain a high flexibility of the sewing device in terms of sewing parameters, a programmable SIMATIC multiaxis control system of type FM 357 made by Siemens AG was used for the coordination of the individual motion sequences.

In connection with the development of the sewing device, the user software required was created for the individual components. The FM 357 CNC program ensures the feeding of the material to be sewn as well as the synchronization of the axes of the sewing machine head during the sewing process by performing so-called synchronous actions for real-time processing. Theoretically, the drive and control concept allows for any seam construction to be produced.

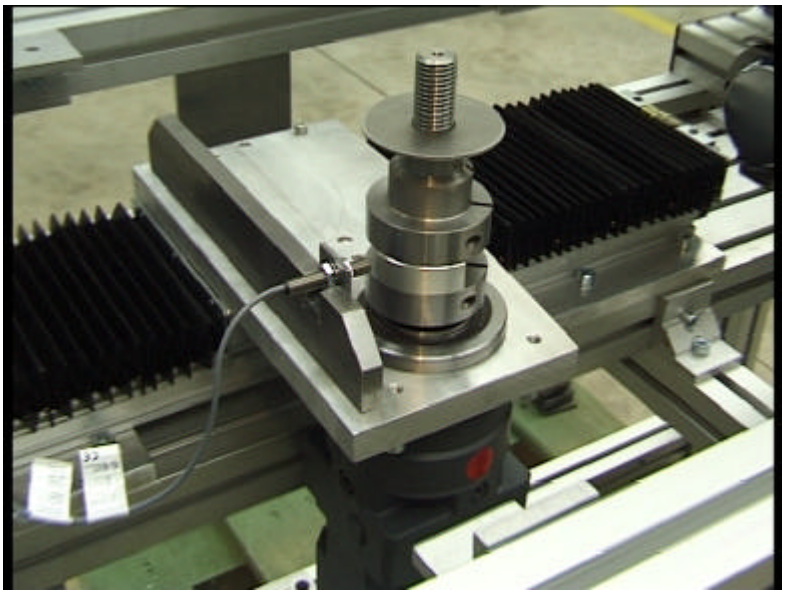

Figure 2 : Unit for clamping the material to be sewn.

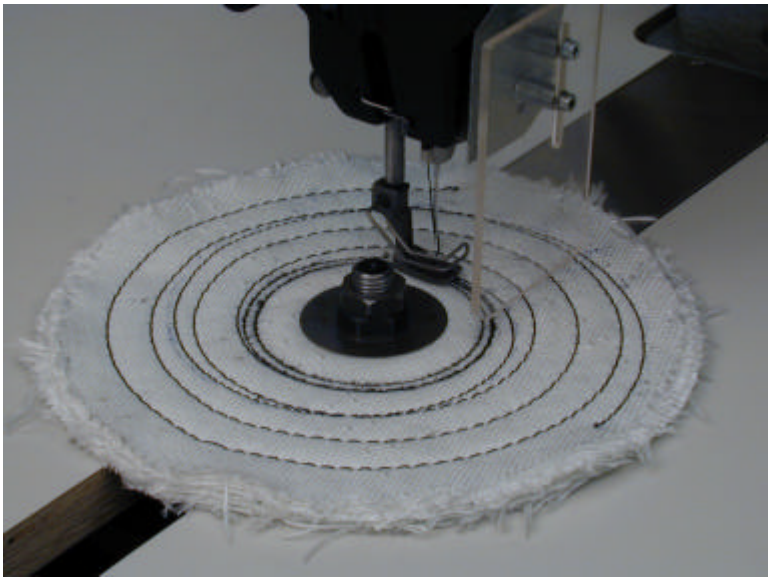

Figure 3 : Detail illustration of the material to be sewn