

SIMULATION OF THE SEWING PROCESS

Project manager:
Authority responsible
for the project:
Project number:

M. Märker, Dipl.-Ing.
BMW - Gewiplan
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Initial situation

The sewing process represents the extraordinarily complex interaction of operator, machine, material and method. To make this process transparent and mathematically determinable is to be considered a contribution to rationalization.

Research target

The research target is to create the basis for the computer-aided modelling of elements of the sewing process, especially for overlock sewing machines and double chain stitch sewing machines.

Research result

The research result comprises the following main factors:

- Analysis of the sewing process including the investigation into individual elements in the sense of computer-aided representation, investigation into sewing zones
- Investigations into the main factors of the sewing process, such as yarn tensile strengths, stitch formation, effects of rubbing, thread feed
- Use of existing software and development of appropriate programs to simulate elements of the sewing process.

Human action cannot be simulated on the basis of simple assumptions. The properties of the material to be sewn as well as those of the sewing thread vary considerably. Simulation of the properties of the material to be sewn and of the sewing thread has to be based on simplified assumptions. What is certain is the mechanical simulation of the sewing machine and its driving system in so far as these are positively coupled. Movements of stitch forming elements of the sewing machine were simulated with the aid of 2D- and 3D-CAD programs. Then the sum of partial sections of the thread was ascertained as the basis for yarn requirement determination. A number of basic programs allow a simplified simulation of the movements of sewing machine drives as well as fast changes of parameters.

Measurements of yarn tensile strengths and rubbing forces yielded new findings in respect of rubbing effects in the sewing process and confirm the stitch formation analysis.

A relation between the coefficient of friction and the abradent diameter was established and mathematically formulated.

Computer programs for the simulation of yarn movement and yarn tensile strength at various points of yarn passage were elaborated. These programs are the result of joint research work carried out together with TBZ PARIV Chemnitz and the Institute of Mechanics of Chemnitz-Zwickau Technical University.

Application and economic advantages

The sewing process analysis performed and the investigation into main aspects of the sewing process contribute to the further examination of the sewing process and to the objectification of the sewing processes. The application of existing software and the development of appropriate new software allowed to speed up the research and development activities and to design and optimize stitch forming elements. The results of the research subject and those of the process analysis and the measurements as well as the simulation software are of importance to other sectors of textile machine engineering. This applies, in particular, to sectors where problems of yarn movement, yarn guiding and yarn feeding have to be overcome.

Subsequent investigation into the further handling of problems of sewing process simulation are necessary.

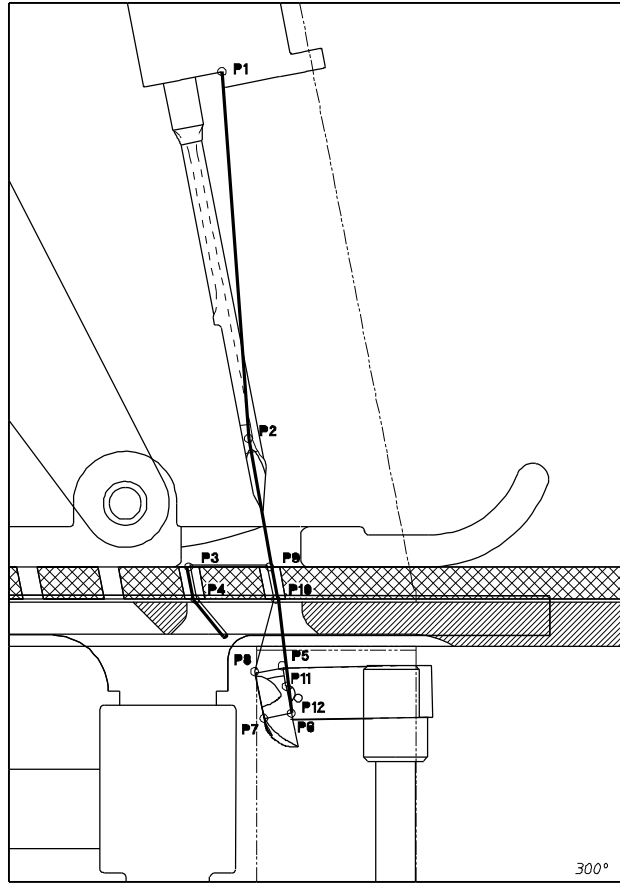


Fig. 1: Needle thread passage at a double chain stitch sewing machine

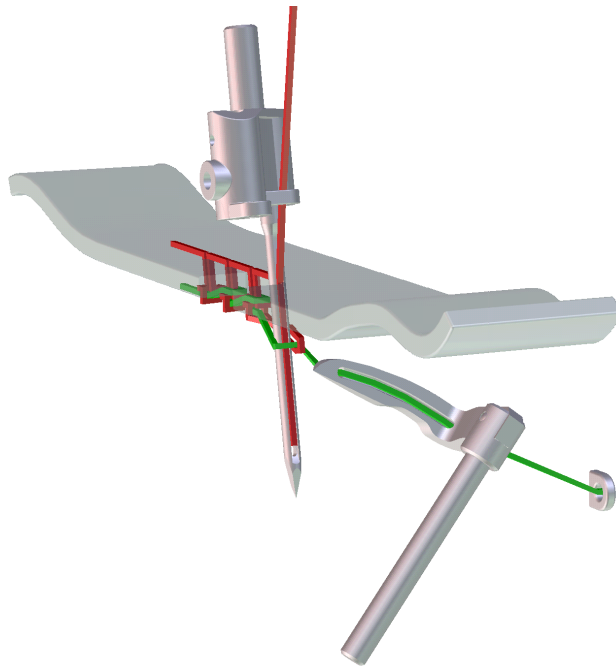


Fig. 2: Phase of stitch formation - double chain stitch