

## A KNITTING MACHINE PROVIDED WITH FREELY SELECTABLE MOTION FUNCTIONS

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### Initial situation

The current trends towards using individual drives for mechanically coupled working units and elements are also reflected in various areas of textile machine construction. For example, initial applications ready for series production and involving electronically coupled electric individual drives may be found on raschel machines and automatic warp knitting looms made by Karl Mayer Textilmaschinenfabrik GmbH.

### Research target

The aim of this project is a considerable increase of the flexibility of article change-over operations in textile machines, in particular contour knitting machines, that require more than mere modifications of the thread systems to be fed to the machine. By separating the information processing operation from the process of mechanical energy conversion, a direct influence is to be exerted on the motion functions of the individual operating elements. At the same time, the possibilities of producing most different warp-knitted fabric structures may be further improved and extended by eliminating or reducing the kinematic limitations of individual operating elements. The use of the existing CNC programming surface for a great variety of applications will allow operators to enter various machine parameters for controlling and changing the motion sequences of the driving elements in a most efficient manner.

### Research result

The investigation into and analysis of any replacement of mechanical driving units clearly show that technical modifications to be applied may be diverse and comprehensive. Surveys were prepared to allow for individual drives to be selected systematically and to be designed according to the requirements of the specific application. On contour knitting machines, linear motors for the alternating motion of the guide bar guarantee extended patterning possibilities in complex three-dimensional warp-knitted fabric structures.

The basic technology is founded on two concepts showing in more detail the amount of flexibility to be reached for the principal technological parameters. The concepts may also be used in the general design of any bar-carrying textile machines.

The use of individual drives leads to the following conclusions :

- The number of mechanical components may be considerably reduced.
- There is a possibility of optimizing technological conditions.
- Basic concepts of machine design may change considerably.

Using the example of knitting tool drives, a number of design possibilities for individual elements and the textile machine as a whole will be presented. Calculation examples and design concepts show the general validity of the results obtained. A high-performance CNC system involving integrated digital controls and drives meets the high requirements made on machine motions and fulfils a wide range of marginal technological conditions.

### Application and economic advantages

When choosing the machine concept to be used, economic issues are of major importance. Improved setting and manufacturing options must be compared with the number of articles produced, the production cycles employed and the machine change-over times reached when using conventional equipment. Research workers must find out which amount of flexibility prospective customers expect from the machine and are prepared to pay for. Finally, the use of individual drive systems may give machine builders considerable advantages in economic terms which they may pass on to their customers, while meeting any frequently changing requirements of textile products to be manufactured.

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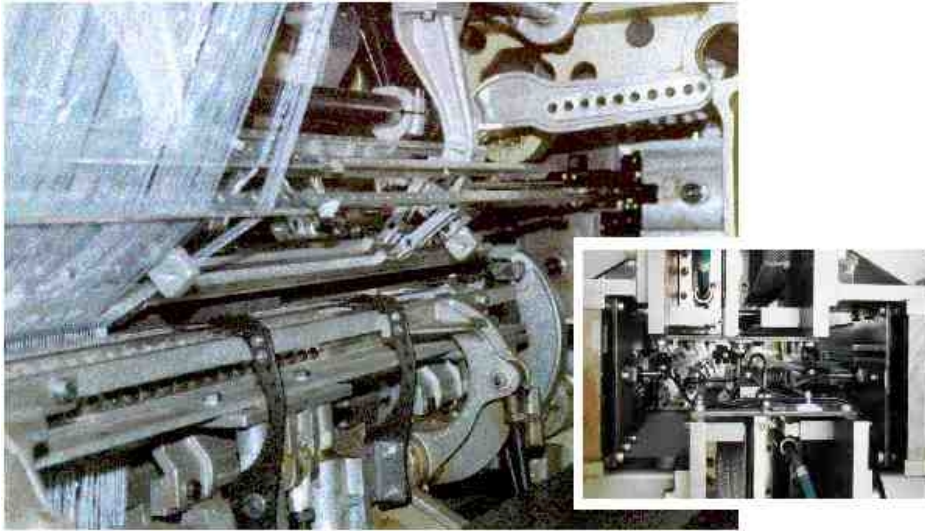


Figure 1: Linear direct drives at a contour knitting machine



Figure 2: Interdigital linear motor

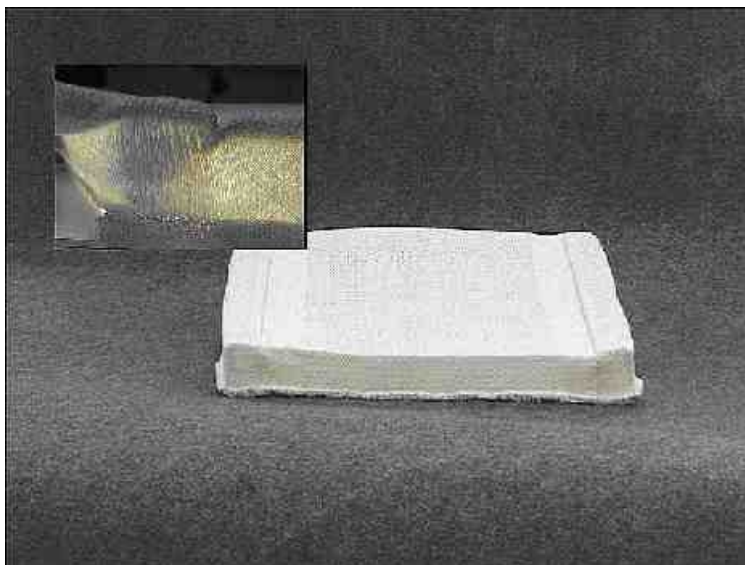


Figure 3: Seat cushion