COMPLEMENTARY WEFT LAYING DEVICE

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Initial situation

The technical textiles sector is heavily expanding and offers versatile and promising fields and cases of application. Developments in this area are further supported by the emergence of new textile starting materials, and lower prices. Offering more variable fabric constructions, knitting machines are gaining ground over weaving machines, while complying with high quality requirements.

Research target

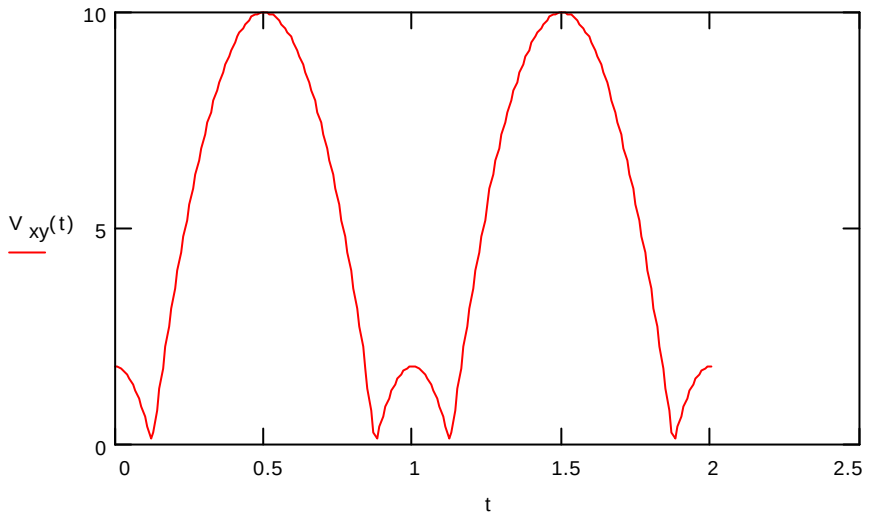
The project is aiming at implementing in industrial practice a proposed invention concerning a complementary weft laying device providing for the widest possible diversity of patterns. Several solution principles are to be examined in a theoretical approach, and the optimal version is to be implemented in form of a laboratory prototype. Measurements are planned to present the advantages to be expected in processing. Another focus is on the development of new weft patterns and the combination of open weft structures with chopped glass fibres.

Research result

Complementary weft laying devices were confirmed to have a positive influence on the process of manufacturing technical textiles. Appropriate hardware and software components were developed to ensure a constant thread unwinding speed at the bobbin creel of the knitting machine. This option eliminates peak stresses developing when the thread is drawn off the winding at the beginning of the weft laying device traverse, and it reduces the maximum speed to a lower average value. The measurements of the thread velocity performed at the weft bobbin creel and those of the thread tensile strength performed at the superstructure and the thread guide corroborate the above assumptions. The speed of the testing machine was raised from 750 to 1000 rpm depending upon the articles manufactured, without any fault in the interlacing of the weft thread. Of special advantage was the arrangement of lattice-type thread tensioners in the superstructure of the machine. As a result of the constant thread velocity, the creel did not require any thread brakes. The friction conditions in the feeding system were examined. Using the calculation program for the driving cams of the three axes, it is possible to automatically determine the three characteristic tables upon entering the variables (number of threads, insertion width etc.) for both types of machine (RS2 MSUS warp knitting loom and 14022 P2-2S stitchbonding machine). The pattern change at the MSUS was facilitated thanks to the integration of an industrial PC.
Provided with a web retainer at the stitchbonding area and a larger slide needle traverse, the stitchbonding machine is now able to sew parallel weft and chopped textile glass threads. At the ITMA 1999, Paris, this machine and the MSUS warp knitting machine were displayed with their respective complementary filling carriers.
Investigations were conducted into increased repeats in weft patterns. The limits of using complementary weft laying devices were identified, and possible solutions were formulated.

Application and economic advantages

Articles in the trade press, experts' conferences and trade fairs are proof of the increased importance of using technical textiles made on knitting machines. The proposed complementary weft laying device is aimed at improving processing conditions and the quality of textile fabrics.
Noticeable improvements were found to exist in the field of textile glass processing. Tests under practical conditions are still required in order to find out whether complementary weft laying devices may replace single-thread feed wheels, for instance in interlining processing operations. The combination of parallel weft with fibre webs and/or chopped glass threads opens up new vistas for producing innovative product ranges on stitchbonding machines.



$$L_F(t) = L_{XY}(t) + L_{SPEICHER}(t) + L_{GEO}(t)$$

$L_F(t)$	Thead unwinding length at the bobbin
$L_{XY}(t)$	Thread consumption in X-Y plane
$L_{SPEICHER}(t)$	Thread consumption compensation in the weft thread storage
$L_{GEO}(t)$	Thread consumption influence by geometrical conditions

Figure 1: Thread velocity at the weft laying device

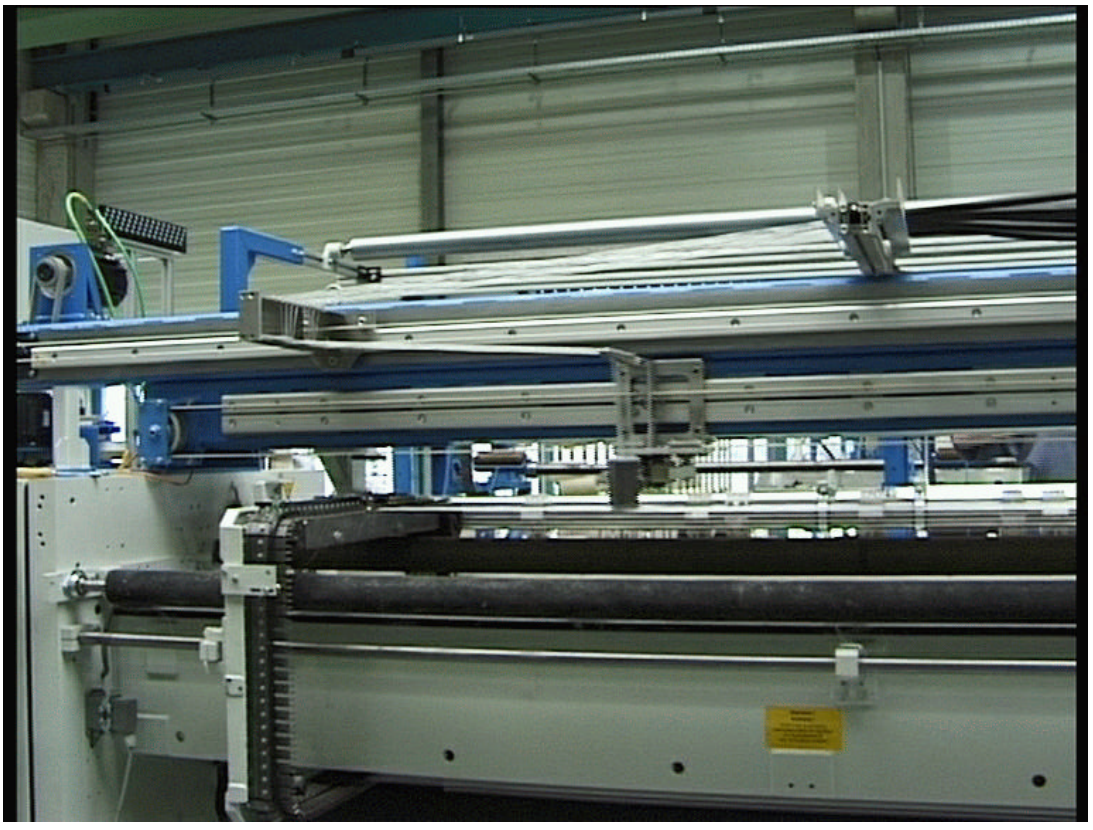


Figure 2: Drive side of the carrier of the complementary weft laying device