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Long-staple spinning processes

Staple fibre spinning is divided into the main sectors of short and long-staple spinning; short-staple fibres are up to 60 mm long, long-staple fibres from 60 to 300 mm long. On the borderline between these two ranges, reference is also made to medium staple with fibre lengths of 45 to 70 mm. Two main processes are used in long-staple spinning systems: carded wool spinning for more full-bodied fabrics in the home textile sector, and worsted spinning, for example for fine and very fine outerwear. In the worsted system, shorter fibres are removed from the fibre structure by means of long-staple combers. This creates the prerequisites for fine yarns, which are essential for producing fine fabrics.

Fundamental aspects of long-staple spinning processes

Rather more bulky yarns for home textiles, such as curtains, furnishing fabrics, carpets and fashionable outerwear, are produced using the carded wool spinning process. In this the web of the long-staple card is separated into narrow ribbons by the web divider, compacted by the rubber gear and spun out into a fluffy yarn on the ring spinning frame for woollen yarns with needle funnel revolving tubes.

Two different processes were formerly used to produce worsted yarn: In the English method, suitable for oiled tops made from long, plain wools, cohesion of the slubbings in the processing stages after the gill boxes is obtained by twisting. What is fed to the ring spinning frames is therefore a speedframe roving.

In the continental or French method, suitable for dry tops with little oiling made from finer, crimped wools, cohesion of the slubbings after the gill boxes is obtained by rubbing due to the crimping. What is fed to the ring spinning frames is therefore a rubbed, i.e. twist-free roving.

The growing importance of manmade fibres and blends such as wool/polyester has resulted in the increasing use of speedframes in the French process, too. As a consequence the English method is now being replaced worldwide by the French method, working with rubbed or twisted rovings, depending upon the content of manmade fibres.

Rieter has never manufactured machines for all stages of the long-staple spinning process. The following comments can be made on the individual Rieter components of the long-staple systems:

Gill box/intersecting

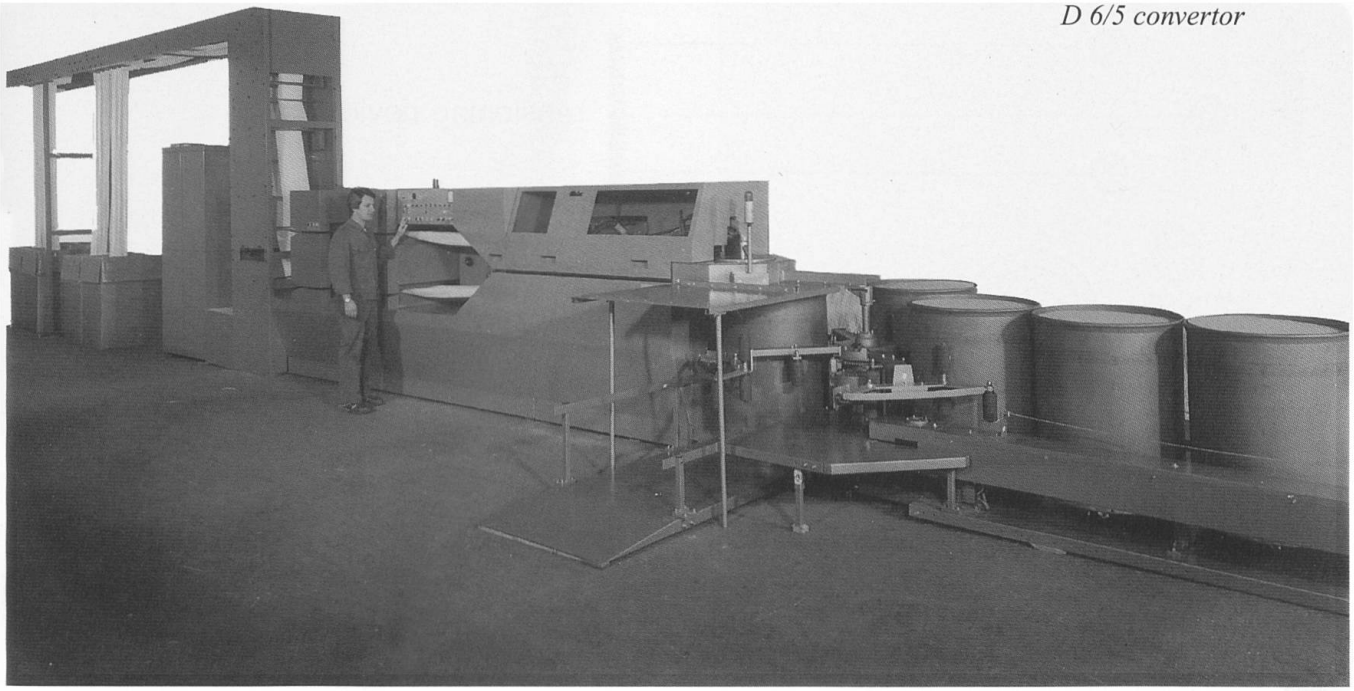
Rieter's double gill box, the intersecting unit, has produced remarkable results as a component part of long-staple preparation. For example, very promising results have been achieved in processing schappe silk with its gill box for long fibres.

Hardened advance spindles were used for feeding the fallers. These elements were produced by the Federal arms and munitions works in Berne (Switzerland), which were ideally equipped for manufacturing special items of this kind.

Intersecting room at the Kriens schappe spinning mill, ca. 1955

D6 convertor

The conversion of continuous filaments into staple fibres has been of particular interest since manmade fibres began to be produced. Machine manufacturers used stretch-breaking or cutting processes for this purpose. Rieter decided in favour of the cutting process at the beginning of the nineteen-fifties, and an appropriate patent licence was obtained from Warner & Swasey. Initial prototypes operated with spiked «porcupine» rollers in the drawing zone, but these proved unserviceable due to their delicate needles. The improvement of these prototypes resulted in the installation of the Rieter double gill boxes, which achieved high performances at various stages of development. Intersecting convertors D6/2 to D6/4 then evolved from the D6/1 spiked roller convertor. These were further developed into the D6/5 Series, with output some three

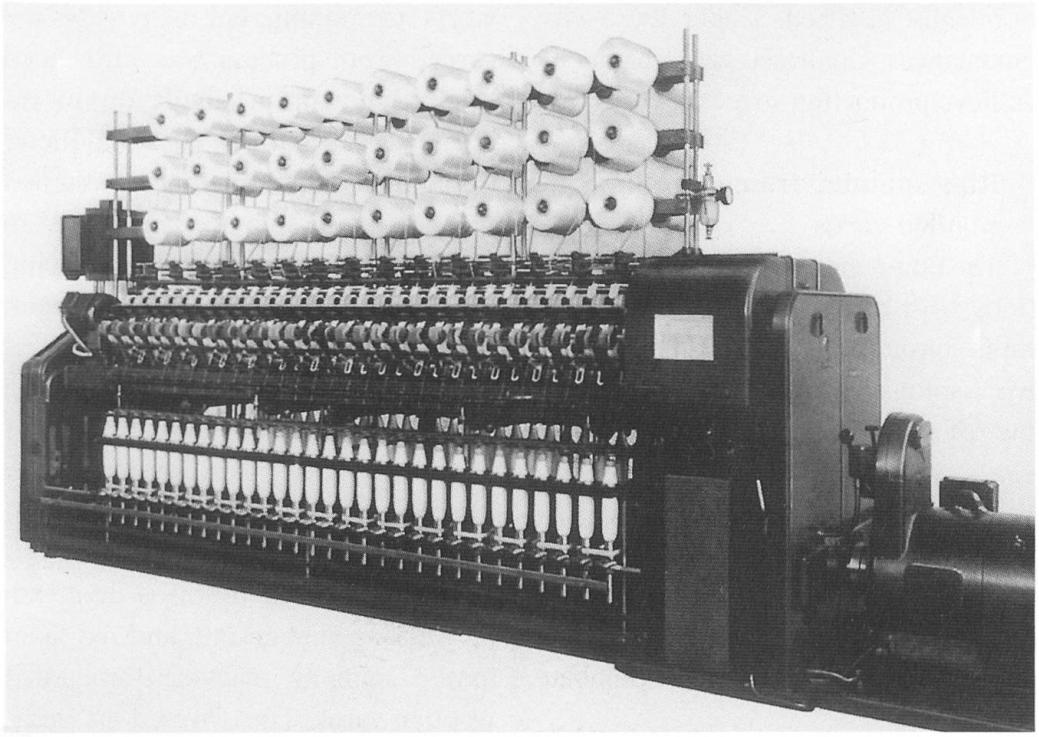


D 6/5 convertor

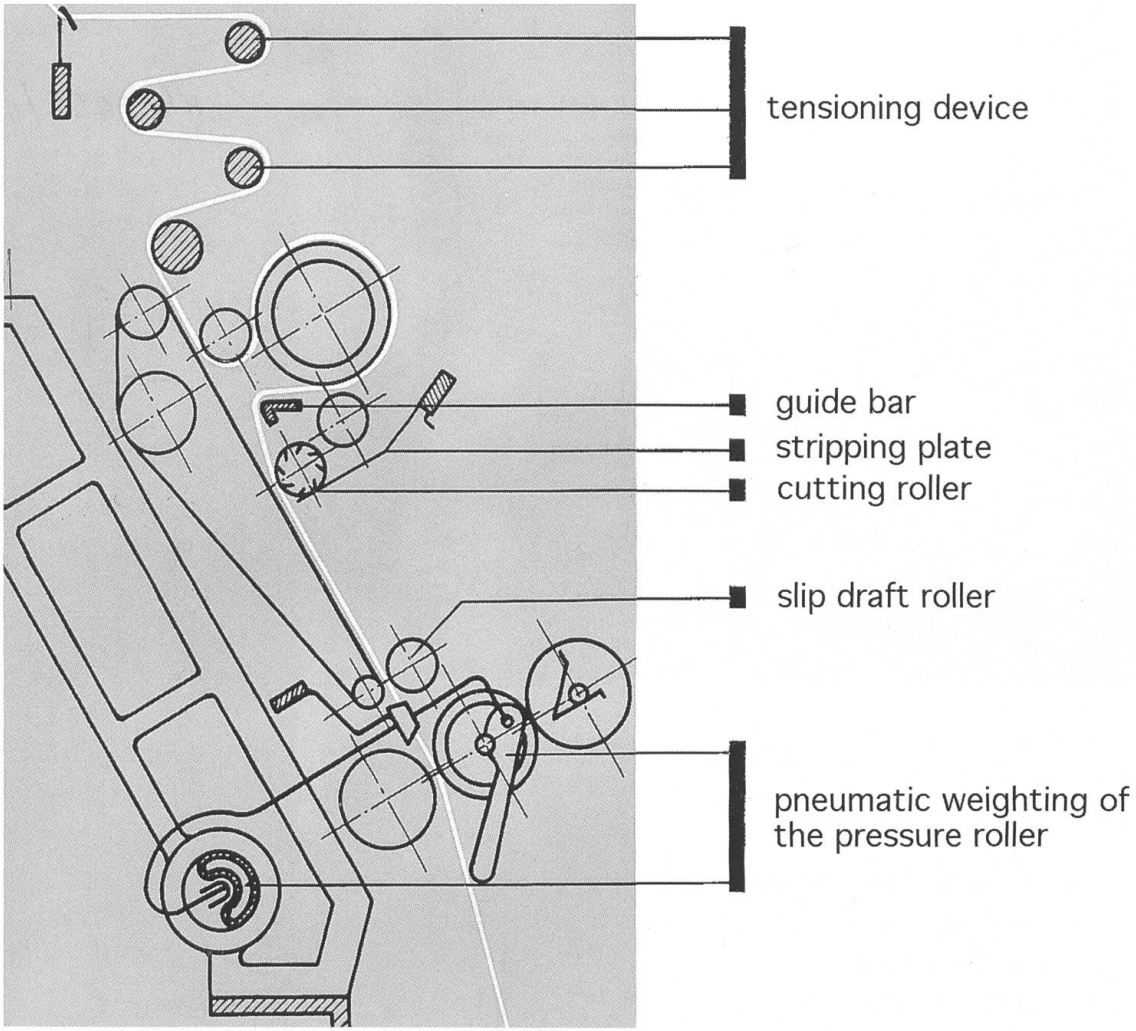
times higher, using Hanseatische Maschinenbau-Gesellschaft's HMG chain gill intersector. Finally, in order to simplify its product range, Rieter sold its latest convertor model to Schlumberger, which replaced the HMG intersector with its own NSC drawframe and achieved remarkable production data with this machine. The history of Rieter's line of convertors therefore continues in the Schlumberger machines.

«Cutdrafil» cut-and-spin process

At the beginning of the nineteen-fifties Rieter took a close interest in the Cutdrafil cut-and-spin process, which produced long-staple yarns from fine filament strands. The cut-and-spin process was based on existing worsted ring spinning frames, which were equipped with a cut-and-draw mechanism with a rotating fibre cutter. This process imposed very high standards on the quality of the fila-



Cutdrafil ring spinning frame:
240 spindles, 90 mm gauge, 60 mm ring diameter, 250 mm traverse



Cutdrafil spinning machine.
Cross-section diagram of the cutting and drawing system

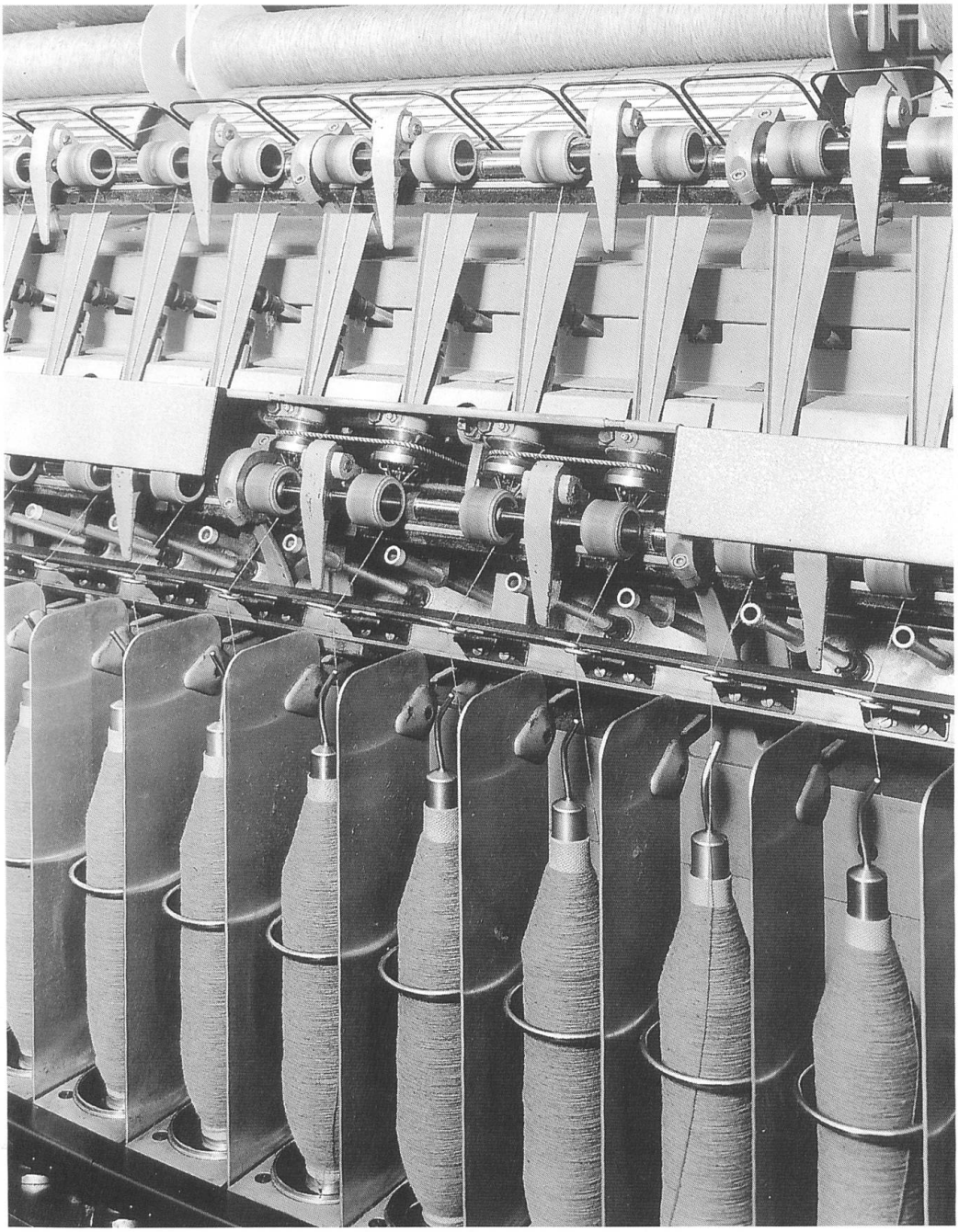
ment strands, requiring a level of performance which could not be economically justified. Under these circumstances Cutdrafil was unable to achieve production success.

Ring spinning frames for woollen yarns

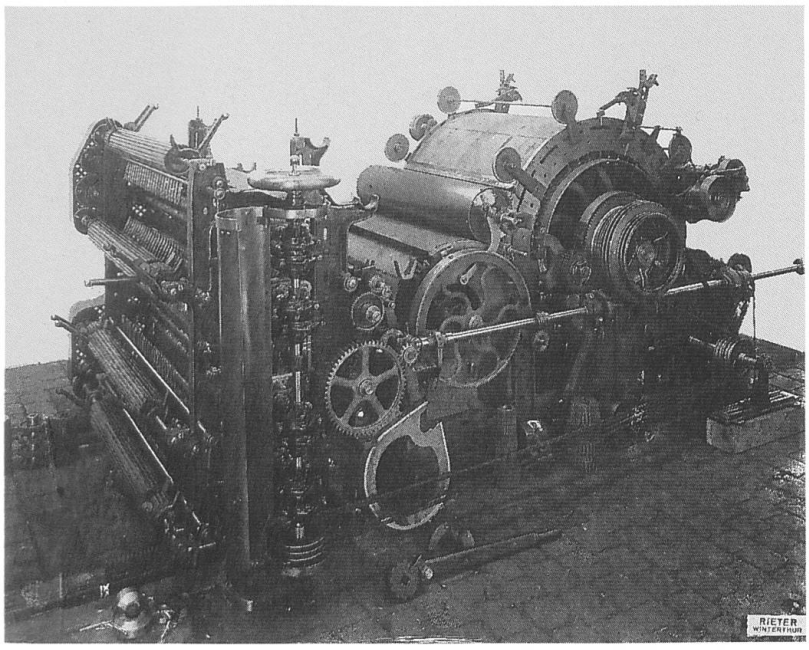
The company developed close relations with blanket and cloth weaving mills through its interest in carded wool spinning. An outstanding example of this was undoubtedly army cloth, which required carded yarns of very high quality. Due to these requirements and the demands in respect of home textiles, Rieter was not in favour of the latest mules, such as those manufactured by MAK and Spinnbau (Germany).

Ring spinning machine series 37, H1 and H3 from this product line are worth mentioning. For many years the carded wool process was influenced by developments in spindle tops for reduced thread balloon tension. Rieter discontinued production of carded woollen yarn spinning machines in 1971, again with a view to simplifying the product range. In this case the relevant know-how was not sold. In this context it is also worth mentioning a sideline from the early days of carded woollen yarn systems, the Schorsch Rieter System, which processed spinnable strands to slubbings with a roller card, followed by a web divider and rubber unit, and fed them to the spinning machine for carded woollen yarns. This covered the occa-

H3 woollen spinning frame; drawing system with needle tubes and spindles with spindle top devices for reduced yarn tension



Fillet card with web divider



sional orders in market niches for mixed shoddy yarns, which never assumed any great importance, however.

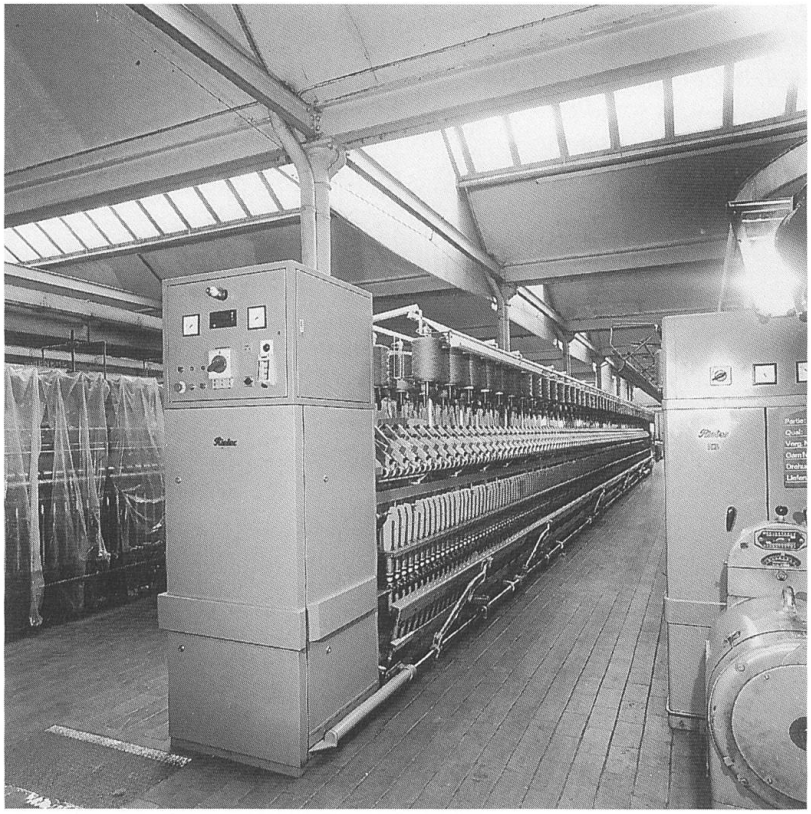
F2/1 long-staple speedframe

The 35 Series short-staple speedframe could be equipped with a long-staple drawframe which was one of the best in the sector with double aprons and servo drive for adjusting the nip gaps. This system failed to make a break-through due to small production volumes and correspondingly high prices. Finally, new designs such as that by Schlumberger-NSC with

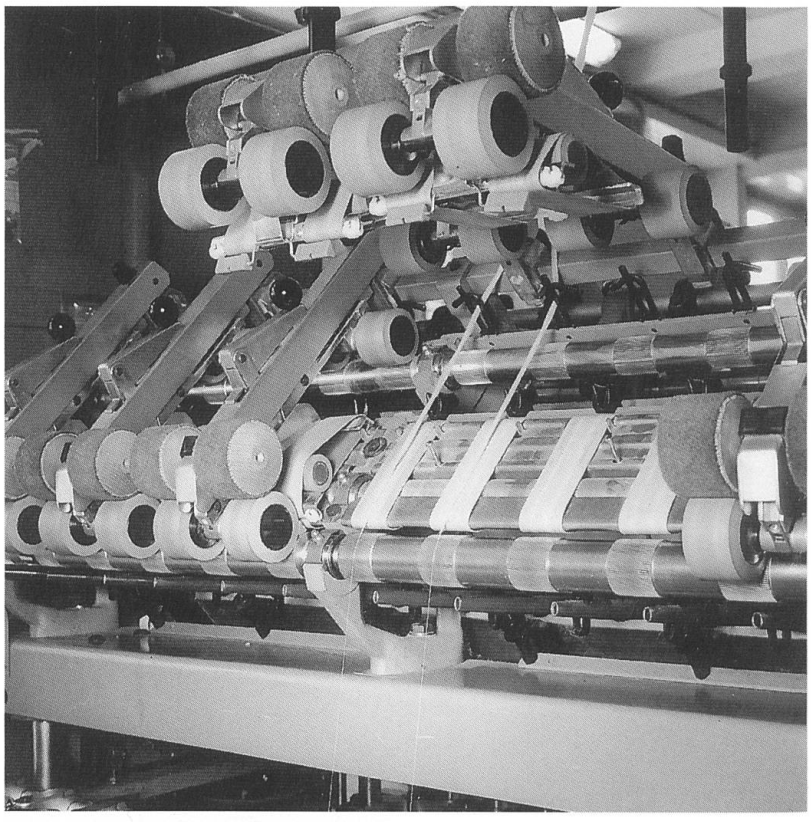
overhead-drive flyers squeezed the F2/1 out of the market.

Worsted ring spinning frames

After initial trials with the 31 Series ring spinning frame in the early nineteen-thirties, a long-staple drawframe was grafted on to this short-staple ring spinning frame with moving spindle rails. This version attracted a remarkable amount of interest, finally leading to the new design of the 37 Series, which became available in about 1938. The 37 Series, the first machine with automatic yarn underwinding and stop motion when packages were full, was sufficiently versatile to operate in the carded wool spinning process, in the worsted process as the H2 Series, in ring twisting, and finally also in early draw-twisting of continuous filaments. The integrated doffer for package change was introduced to the worsted process with the development to the H6 Series. The Sempione brand name also helped to make customers throughout the world familiar with Swiss quality products through the H6 machine. The last new design of worsted ring spinning frames, the H0/1 Series, produced yarns featuring absolutely outstanding quality characteristics with the patented Rieter K2RM drawframe. Unfortunately, manufacturing costs were also high due to the low volumes produced. In a shrinking worsted market even the unique K2RM drawframe of the H0/1 was only an insufficient guarantee of future success. As Rieter concentrated its resources, therefore, further development and production of worsted ring spinning frames was discontinued after 1985.



H0/1 ring spinning frame with doffer



K2RM long-staple drawframe

Long-staple OE rotor spinning processes

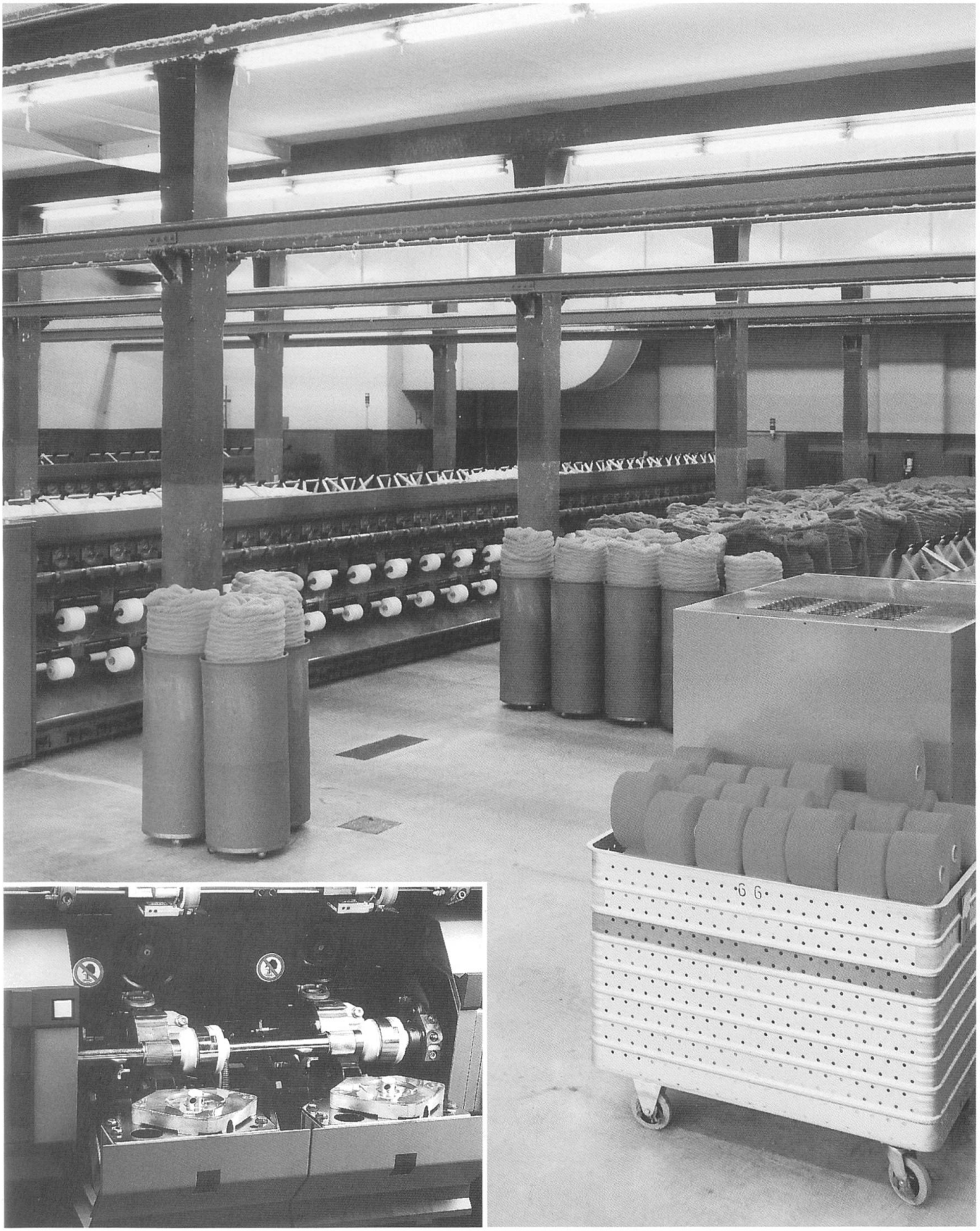
The Rieter/Schubert & Salzer product range includes the RL10 long-

staple rotor spinning machine, which is well positioned in the field of blanket and carpet yarns. Unfortunately, it also serves a market niche, so that marketing efforts have to take account of the priorities of these textile sectors.

New long-staple spinning processes

The REPCO System developed by Australian inventors has repeatedly been a subject for discussion since the nineteen-seventies. Here eight rovings

RL10 rotor spinning machine.
Bottom: open spinning box



are grouped into two slubbings and processed via rubber drawing systems with phase-shifted false twist into four yarns. This process, which would certainly be useful for fine, twisted worsteds, has not made a breakthrough.

In the cover spinning field, processes for medium and coarser yarns are currently offered by Leesona, Süssen and NSC-Schlumberger, for example. Developments for finer yarns have not been crowned with success to date. Cover spinning seems to confirm its qualities on a small scale rather than making its mark across the whole spectrum.

Based on its assessment of the overall situation, Rieter has hitherto refrained from reacting to new long-staple developments with production machines.

Long staple:
appraisal and forecast

Blends, for example of wool and polyester, opened up significant market potential some years ago for worsted and semi-worsted in particular.

It must not be assumed that the increase in sheep breeding for meat will increase the supply of wool, since meat and fibre production do not develop in parallel. For planning purposes it is as well to allow a square metre for the manufacture of an annual ton of fibres of chemical origin, 26 000 m^2 for the agricultural production of cotton, and finally some 700 000 m^2 for wool production as a by-product of animal husbandry. In view of the growth in world population and the corresponding demand for food, fibres of chemical origin therefore offer the best potential.

Production levels in the classical outerwear manufacturing countries reflect a declining trend in Europe, no change in the USA, and a rising share in Asia. The general shift in textiles in the direction of the Far East is also becoming increasingly apparent in the long-staple sector.

Conventional long-staple spinning, either for wool or for synthetic staple, is a thing of the past for Rieter. It was continued into the nineteen-eighties with the ring spinning frames, and then abandoned.

All options are still open for unconventional long-staple spinning with long-staple rotor spinning machines, and here group management will have to decide accordingly on the action to be taken.