Swiss Turning

Evolution of the Swiss-style sliding-headstock machine

By Keith Crowther, President, AMT Machine Tools

Modern Swiss-style machines have come a long way from their introduction in the early 1900s.

Their design evolved from the requirements of the Swiss watch and related screw machine industries. This industry required screw machines capable of producing very small-diameter parts for which deflection, and subsequently precision, were major issues.

The concept was quite simple: Load the bar into a sliding headstock and use this movement to feed the bar through a stationary guide bush that was positioned directly behind the turning tools. The close proximity of the guide bush to the machining operation (feeding the material past the tool) eliminated the problems typically encountered with conventional screw machines when the length-to-diameter ratio of a part became an issue.

These early cam-driven machines became very popular into the mid-1970s, producing mechanical-type components for the meter industry (water and electric meters) and office equipment (copiers and typewriters) manufacturers.

As the electronic age advanced, circuit boards and electronic components replaced these mechanical devices. Although the mechanical components in these products disappeared, popularity increased for screw machines in the manufacture of small electrical components and in the semiconductor industries.

The same electronic progression brought with it a revolution in the design of machine tool controls. Gone were the cams and feed gears, replaced by servo drives, encoders, and precision ball screws, culminating in what we see today in multichannel CNCs.

New Technology, New Industries

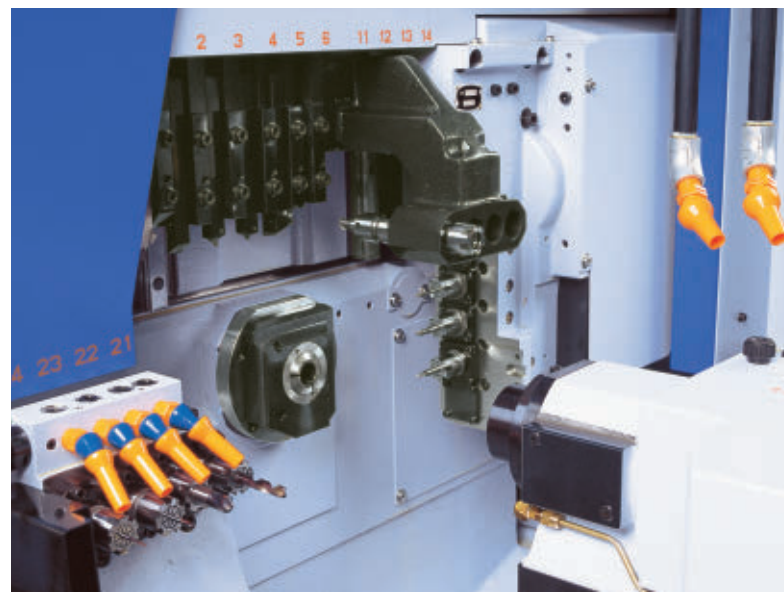
This technology gave the Swiss-style sliding-headstock machine a tremendous amount of flexibility and a whole new marketplace to work in.

Although the capacity of these machines typically fell in the 20-mm-diameter and under range in the 1980s, the appeal to manufacturers of medical components, the dental industry, and aerospace fasteners was vast.

These sliding-headstock machines capable of producing complex, precision finished components were being looked at from a completely different perspective by manufacturers using conventional turning and milling equipment. This can be seen by the number of sliding-headstock machine manufacturers in the world today. Multinational tooling manufacturers have seen the growth of this industry and seized the opportunity to develop specialized, and in some cases quick-change tooling, for Swiss-style applications.

The Swiss-style sliding-headstock machines now can produce complex, precision components limited in some cases only by the imagination of the programmer.

Such is the sophistication of the control and software available for these



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machines. They are built with varying degrees of complexity, from simple five axes and limited live tooling to 11-axis machines with multiple turrets, angle heads, live tooling Y-axis slides, and three channel controls that allow simultaneous machining and overlapping.

With the major loss of simple, high-volume parts, which typically ran on multispindle screw machines, to offshore competition, and the demise of the automotive industry in North America, more and more automotive screw machine shops have turned to the Swiss sliding-headstock machine as a solution to the changing dynamics of manufacturing today.

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The majority of components left to quote on in North America usually are complex and often have very tight tolerances, and the features available on Swiss-style machines can accommodate these requirements.

Manufacturers can also eliminate costly secondary operations by finishing the parts completely in one setup and, if used in conjunction with such options as magazine bar feeders and tool management features, can often reduce labor content in any given part.

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For the many applications in which the length of the component is no longer than three times the diameter of the part, machine tool builders are now producing machines without the guide bush.

While still maintaining many features of modern Swiss-style machines, these versions can run with less attention to the guide bush or barstock tolerance.

It appears ironic, as it was the guide bush concept that gave the Swiss its start in the industry. ■

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