



Do You Suffer From An Ingrown Nail Or Want To Make Great Leaps Forward? A Spring System May Help

A look at the many uses of springs

By Konrad Dengler
Special contributor to *Springs*

Springs are necessary in many technical constructions. This article will provide insights into the variety of spring applications. It will also look at European spring manufacturers as they describe production examples and general considerations for spring design.



Ensuring Mechanical Functions

In industrialized countries, nearly everyone uses springs each day. Most people are not aware of it because many springs seem insignificant or are hidden to the bare eye. However, the significance of a spring can be felt immediately, when it fails.

Think of when the pressed push-button of a PC keyboard doesn't jump back into its initial position or a toaster doesn't return a slice of bread. Consider what could happen if the pressed-down accelerator pedal of a car remains in its position instead of returning back. This is a potentially frightening scenario.

Function Principle

Regardless of the particular function of a spring, it can be said that all springs work according to a principle: By changing their shape, they store, transform or set mechanical energy free. Springs are elastic, meaning they return to their initial shape after having been unloaded. Springs are also used to absorb impacts or vibrations.





Some years ago, the German commercial newspaper *Handelsblatt* quoted Horst Dieter Dannert, then-secretary of the German spring manufacturers association VDFI and current general secretary of the European Spring Federation (ESF): “Technical springs are everywhere, where something is moving. Every light switch, every valve, whether in a power station or in a kitchen, needs a spring.”

Cars, airplanes, typewriters, computers, clocks, washing machines, mousetraps, door-handles, coffee makers or mattresses — these are all products most of us encounter in our daily private or business life that contain several springs which ensure their mechanical function.

History

Since its very beginning, mankind has used the elastic characteristics of natural materials and forged metals like copper and iron. Fibulas made from copper were used to hold together clothing and can be seen as forerunners of modern safety pins.

Since the Middle Ages in Europe the development of iron production and wire manufacturing had a reciprocal influence on the applications of springs and spring manufacturing technology.

Today’s armaments industry began with weapons like crossbows and rifles that were based on spring mechanisms. At the beginning of the 14th century watchmakers used springs to manufacture clockworks. Craftsmen improved continuously the quality and the shape of springs.

In the 18th century spiral springs were generally used for clocks and fob clocks. Today, the automotive industry is the most important customer of spring manufacturers, but other industries which produce investment and consumer goods need large quantities of springs too.

Manifold Variety of Shapes

As the operating conditions can vary greatly with many parameters acting on a spring, there is a nearly endless number of construction possibilities concerning the material, shape and design of a spring. Springs can have a standardized shape like

the helical compression spring in a ballpoint pen, but a simple blade or a clip can also be a spring. Plus, there even are creations that, at first sight, seem to be unique works of modern art.

Some years ago, at the annual VDFI convention, Dr. Thomas Blum, then a member of the managing board of the spring machinery builder Wafios and today a consultant for the spring industry, showed pictures of bizarre wire forms that looked like abstract art but were technical springs. The curious form was the result of a phenomenon that is well-known in the spring industry: The designer of a complex technical system had forgotten to consider the spring in his construction. Only at the end of the development process had he noticed that a spring was necessary to make the construction work. A spring manufacturer was confronted with the task of developing a spring that could be mounted into the space which by chance was left free. Such springs can be manufactured on modern electronically controlled spring coilers.

Market Requirements

The following example shows, how important close contact between customers and spring manufacturers is. For the North Italian spring manufacturer Mollificio Valli Srl, situated at Oleggio Castello near the Lago Maggiore, the automotive industry has always been an important customer.

“There is a great demand for all kind of springs,” says Angelo Passarotti, technical and commercial manager of the company. “As these springs must respond to severe operation and safety conditions – for example valve springs must support without problems a life span of 100 million (1 x 10⁸) or more load alternations – the quality requirements are very high. The basic condition for success is therefore a close cooperation with our customers,” explained Passarotti.

“It’s not unusual that two years are necessary for the development and the specification of a new spring before the serial production starts,” said Passarotti.

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Tendencies

Mollificio Valli manufactures springs for many other applications too. In the past they developed springs for educational toys which help children discover and train their senses. However, for cost reasons the production of toy springs in the highly industrialized countries of Europe is in decline and has been replaced by countries in Southeast Europe or China.

On the other hand, new markets are growing. For example, there is an increasing demand for springs which are integrated into the hinges of kitchen and other furniture. "These springs assure a certain kinematic for the opening or closing of doors and lids," explains Passarotti.

Henrik Hagens, managing director of Hagens Fjedre AS based at Støvring, Denmark, noticed, "that there is a general tendency towards higher forces and load cycles, smaller tolerances and more spring shapes. The limits of the materials characteristics are exhausted, and there are no imagination limits."

By following its company motto "springs while you wait," Hagens Fjedre AS — which manufactures springs for many small and medium-sized companies in practically all branches like machinery construction, agricultural machinery, energy technology, off-shore-technology and wind power plants — is confronted with new and sometimes original tasks.

The concept means that technical calculations and the production of prototypes and small series are carried out within a matter of days or even hours. "A time ago," remembers Henrik Hagens, "the designer of an arts studio came to us and asked us to make springs which then were inserted into street lamps. These springs don't have a technical function but cause an aesthetic effect which one can see now in the pedestrian zone of a certain Danish town."

Matthias Dietz, managing director of Federnfabrik Dietz GmbH, is also familiar with many different spring applications. Springs made in his company hold the pipes of organs, while other springs help adjust the many little mirrors of operating room lamps or control the blood flux in dialysis automats.

The company, based in Neustadt near Coburg in Southern Germany, manufactures springs and bent parts which are used in many sectors like automotive, electronics and electrical appliances, locks, jewelry, decorative articles and even devices which can help children train their motor skills.

Where do new ideas concerning the application of springs come from? "We cultivate longstanding relations with our customers; we are of course open to every inquiry," says Dietz, "and have our own creative team which stands ready to develop and produce concepts for innovative spring manufacturing."

Original and Witty

There are nearly no limits for the application of springs. Here are three interesting, original and witty ideas.

Years ago a German pedicurist developed a spring system which immediately helps eliminate pain from ingrown nails and corrects the nail growing process. Furthermore, painful operations can be avoided. Orthonyxists who have been trained to apply the "VHO-Osthold-Method® perfect" are able to apply correctly the "VHO-Osthold-Brace® perfect" (www.VHO-Osthold.com).



Another interesting spring application has also to do with the feet: the "Pogo Stick." The stick is equipped with handles, footpads and a compression spring. The operator places his feet on the footpads while balancing on the pole, then jumps or presses down on the footpads to compress the spring. When the spring has been fully compressed, the operator lifts his weight, aided by the recoil of the spring, being launched several inches or feet into the air. This process is repeated to create a hopping action.

Finally there is the "Slinky", a long coil with the shape of a simple helix which can "walk" down stairs when the coils stretch and reform as gravity moves them down each step. More information on these products are available at Wikipedia (www.wikipedia.org), the free Web encyclopedia.



Conclusion

Springs are needed nearly everywhere. As there is a huge variety of applications and a lot of aspects to be considered, the requirements of all spring applications can't be satisfied with a few standardized spring products. Spring manufacturers can be assured of their competitiveness if they have experience, mental flexibility, an aptitude for technical contexts, product and production know-how, modern production equipment, and creativity to help their customers discover further spring applications and new markets. ♦

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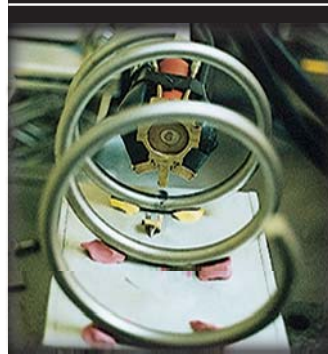
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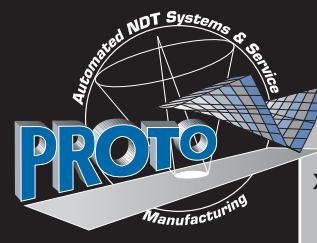
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