

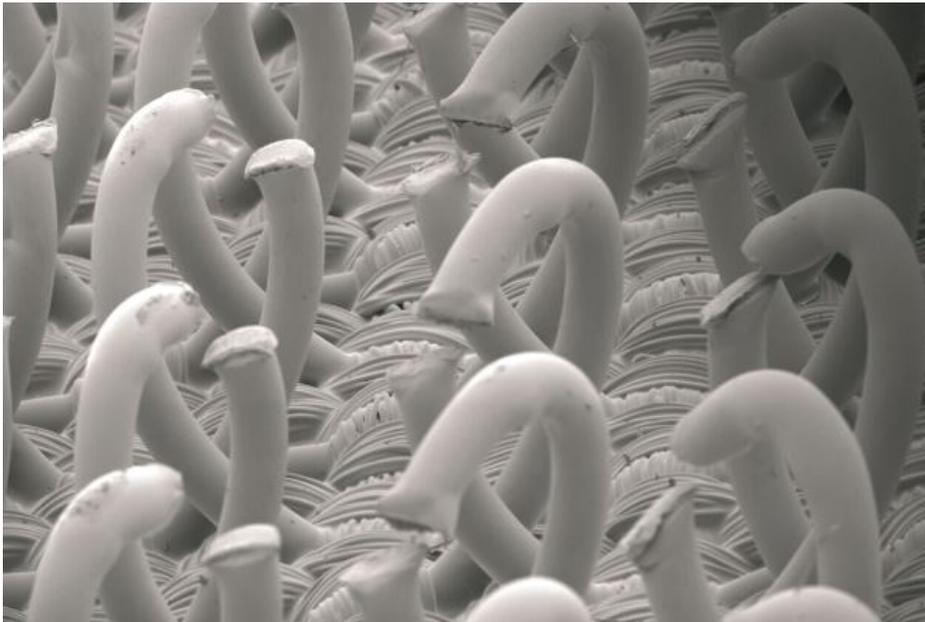


The inspiration behind hook-and-loop (Velcro) fastening

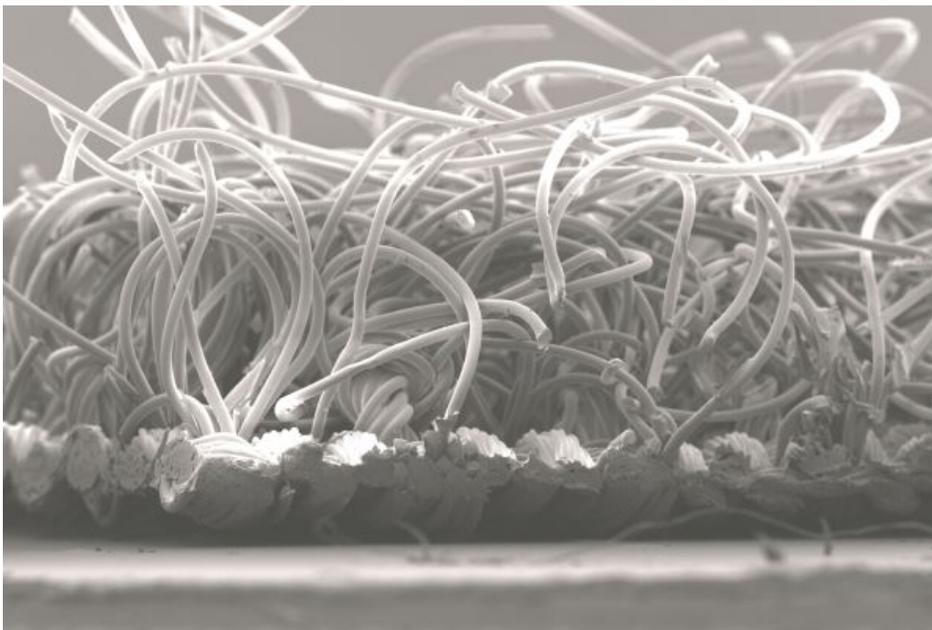
Exploring the development of this footwear security system & its inventor's struggle to perfect his novel product by Stuart Morgan

Hook-and-loop fastening (also known as 'touch-and-close') has been used by footwear designers for many years. The system is commonly used where ease and speed of fastening is desirable – for instance on young children's shoes (where the wearer has not yet mastered the skill to properly tie laces), and some items of sportswear. It has even been utilized in certain styles of fashion footwear.

What is hook-and-loop? Two components are involved, typically consisting of a pair of lineal fabric strips (or shaped items) which are attached – normally by stitching or adhesive – to the opposing surfaces to be fastened. The first face features tiny hooks, and the second has even smaller loops. When the two components come into contact, the hooks catch in the loops and the two pieces bind together. When separated, by pulling or peeling the two surfaces apart, hook-and-loop strips make a distinctive 'ripping' sound.



Close-up of the hook tape of a hook-and-loop fastening



The magnified view of loop tape

Birth of an idea

It is a common misconception that the first hook-and-loop fastening was designed by the USA's National Aeronautics and Space Administration (NASA) for its space program. While it is true that the organisation made good use of this product (each space shuttle reportedly flew equipped with ten thousand inches of a special fastening made of Teflon loops, polyester hooks and glass backing, used in the astronauts' suits and to anchor equipment), the idea for hook-and-loop fastening actually dates back to the early 1940s.

The hook-and-loop fastening system was conceived in 1941 by Swiss engineer, George de Mestral. The idea reportedly came to him after returning from a hunting trip with his dog in the Alps. He took a close look at the burrs (seeds with hooks) that kept sticking to his clothes and his dog's fur. On examining them under a microscope, he observed hundreds of 'hooks' that caught on anything with a loop, such as clothing, animal fur, or hair. He soon saw the possibility of binding two materials together in a way that they could be easily parted – if he could work out how to reproduce the hooks and loops. This is a classic example of the copying of nature's mechanisms, called 'Biomimicry'.



A burr – the inspiration for the invention of hook-and-loop fastening

With the help of a weaver, two hook-and-loop strips based on cotton were made. However, the cotton wore out quickly, so Mr de Mestral turned to synthetic fibers. He finally selected the recently developed nylon and, through trial and error, eventually discovered that, when sewn under hot infrared light, nylon forms hooks that worked well for the hook side of the fastening. Although he now knew how to make the hooks, he had yet to work out a way to mechanise the process, as well as making the looped side of the fastening.

At this point, Mr de Mestral found that when nylon thread was woven in loops and heat-treated, it retained its shape and was sufficiently resilient.

Nevertheless, the loops had to be cut in exactly the right place so that they could be repeatedly fastened and unfastened. He bought a pair of shears and trimmed the tops off the loops, which worked well. It took another eight years to mechanise the process of weaving the hooks and a further 12 months to create the loom that trimmed the loops after weaving them. In total, a decade passed before an efficient mechanised process was created.

Mr de Mestral submitted his idea for patent in Switzerland in 1951, and this was granted four years later. The original product – ‘Velcro’ – was born, a name taken from the French words ‘velours’ (velvet), and crochet (hook). Within a few years, patents were also obtained in Belgium, Canada, Germany, Italy, Sweden, Switzerland, the Netherlands and the UK.

Breaking into the market

In 1958, a newspaper columnist in New Hampshire, USA, wrote: ‘It is with understandable enthusiasm that I give you today an exclusive report on this news: A zipperless zipper has been invented – finally.’ Soon, this ‘zipperless zipper’ was being marketed in the USA, as well as in South America and Japan. Mr de Mestral went on to obtain patents in many other countries as he expected an immediate high demand. However, breaking into the fashion market proved a tough challenge. The integration of hook-and-loop into the textile industry took time – in part because it was generally seen as having a ‘cheap’ appearance.

After continued development of the materials used, hook-and-loop fastening started to gain acceptance when it began to be used in the aerospace industry to help astronauts don and remove bulky space suits with relative ease. Then skiers, and scuba divers recognised relevant applications for their own use. By the mid-1960s, hook-and-loop fastening was being used in futuristic creations by a number of well-known international fashion designers.

In 1978, Mr de Mestral’s patent expired, prompting the introduction of low-cost imitations – particularly from Asian companies. Today it is a multi-million-dollar industry, with the product utilised in many footwear producers’ collections.

