FIREWORKS COMPRESSED AIR AND MICROCHIPS ARE CREATING INCREDIBLE SYNCHRONISED DISPLAYS, SAYS **CHRISTIAN SYLT**

A new big bang theory

Fireworks have been made in pretty much the same way since being invented by the Chinese in the 9th century – gunpowder launches them and explodes. But this is all changing, thanks to microchips and compressed air.

The first giveaway that the new Wishes fireworks show, premiering this month at Disneyland Paris, isn't your average display is the absence of the usual sulphuric smell in the air as the first rockets are launched. In fact, there's no trail of smoke or screeching as they soar. The fireworks seem to appear from nowhere and they aren't your typical chrysanthemum bursts.

Crystal clear shapes of pink hearts, stars and even smiley faces explode in the sky, choreographed to the crescendos of classic tunes. Unsurprisingly, there's even a mousehead-shaped blast. After 12 minutes and 700 fireworks have passed, the only question is 'how on earth did they do that?'

The secret sits in an enclosure close to the theme park's centrepiece castle, where rows of black tubes, with cables coming out of them, point towards the sky. Firework rockets are wrapped in plastic bags to protect them from the elements and placed in the tubes but there aren't any fuses to be lit because there isn't any gunpowder.

Snap, crackle and pop: Disneyland Paris is pioneering a new technique for staging firework displays – and it means smoke-filled stadiums and back-firing rockets could soon become a thing of the past

Perfect timing

Adjusting the pressure of compressed air allows precise control over the height the rockets reach. Without the need to wait for fuses to ignite, the display can be timed to the microsecond. The absence of smoke to interfere with other explosions also allows complex arrangements.

'The goal is to paint a picture in the sky,' says Ben Schweigler, chief scientist for Walt Disney Imagineering. 'You want the shell to go to the exact spot in the sky each time,' he adds. And since pyrotechnicians don't need to tend the launch site, there's less risk of being hit by backfiring rockets.

The new system was developed in California, where Disney's theme park has been subject to increasingly strict air pollution regulations. Ground smoke is now cut by at least 50 per cent and noise has also been dramatically reduced. Only occasional puffs of water vapour rise from the tubes as the fireworks take off.

The shell at the heart of rockets is a simple device – a 15cm sphere made from cardboard and packed with gunpowder and pellets known as stars. These are explosives mixed with bright-burning metallic salts, which give fireworks their colours. When a shell explodes, the stars ignite, creating the sizzling effects.

Final countdown

A tiny capacitor charged before take-off powers a mini-circuit. Once launched, the chip begins its pre-programmed countdown, which can be triggered to time with the tempo of a song and is also crucial to creating a precise special effect.

Given the fireworks' embedded circuitry, it's no surprise that computers play a key role in the development of the displays. To save the cost of staging live rehearsals, shows are choreographed and simulated on specialist software from experts Infinity Visions.

This allows viewing angles and the height, colours and effects of the fireworks to be changed. It's as simple as selecting a shell type from the inventory and clicking the mouse to insert it into a time in the music file. Synchronised field control computers are connected to the firing tubes to manage the show.

Sources suggest that it could cost as much as £10,000 a night to stage Wishes, which took around a year to develop. The compressed-air technology has been in the works for much longer. The air launch patents are being donated to a non-profit group to license the technology for free to the pyrotechnics industry.

The next goals are to invent low-smoke substitutes for gunpowder and other materials used in the actual shells as well as miniaturising fireworks. That means plenty more bang for your buck.

■ *For train tickets from Britain direct to Disneyland Paris, go to www.eurostar.com Tel: 08705 186 186.*

A BRIEF HISTORY

Gunpowder was first discovered accidentally in ancient China when an alchemist packed a chemical concoction into a bamboo tube and threw it on to a fire. The resultant gases blew the tube apart and the firecracker was born. These fireworks were used at special occasions such as New Year, weddings and births as it was believed the bang would dispel any evil spirits.

Marco Polo is believed to have carried the resulting invention from China back to Italy in the late 13th century. It was the Europeans who developed the modern-day displays we are familiar with – particularly the Italians, who were the first to manufacture fireworks. The first recorded fireworks in England were at the wedding of Henry VII (pictured) in 1486 and they have remained popular at major events ever since.