Imperial College London

The Symbioturner

THE KEY TO TURNING YOUR LIFE AROUND

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Design Justification

Versatility- Ability to transmit necessary torque to a large range of key types. We achieved this using a 3 stage planetary gearbox and motor combination with a transmission ratio of 1:97. Torque outputs of up to 3 Nm can be achieved

Ergonomics – Organic form gives a natural feel. We achieved this by creating a gradually curved device with the handle axis at an angle of ~50°.

Weight – Must be portable and designed to not put strain on the users wrist when in use. Achieved a weight of < 200g (weight of an iPhone).

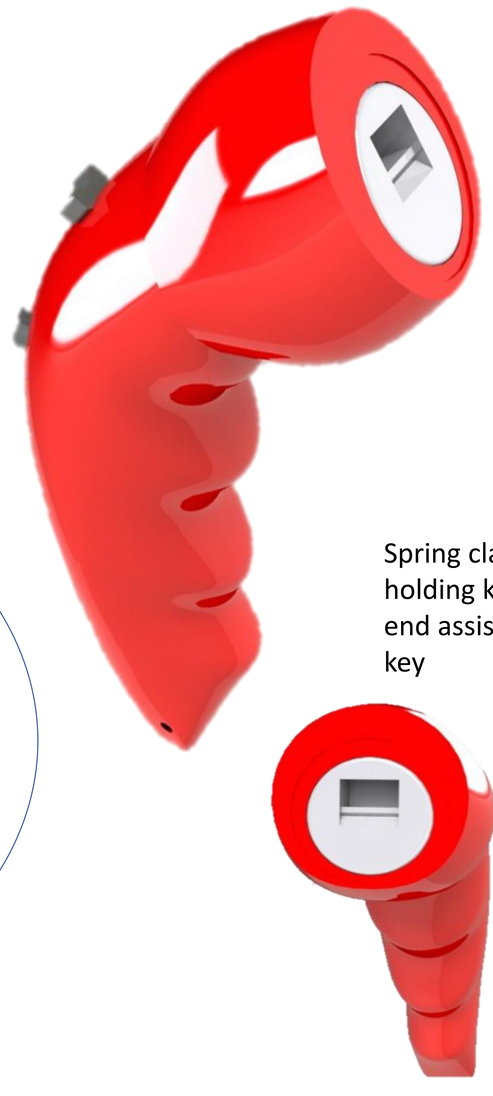
Robustness – Must be long lasting and resistant to wear. (See Stress Analysis and Material Selection). Ribbing in casing also provides additional strength and rigidity.

KEY SPECS

- Able to turn keys at 0.67 RPS at the rated torque of 1.2 Nm (turns an average lock in 2 seconds)
- Can apply up to 2.5x the rated torque.
- Uses an FK-280PA-18165 motor with 1x AA and 3x18500 Rechargeable Batteries.
- 2000mAh batteries achieve single charge life of 275 days.
- Length of 15 cm, face diameter of 8cm (small enough to fit in a pocket).

PROJECT AIM

Our project brief was to act as Engineering Design Consultants in order to develop the conceptual design for a cordless key-turner, aimed at individuals with impaired dexterity.



Stress Analysis and Material Selection

- Mild Steel AISI 1018 used for the carrier and shaft of the planetary transmission system.
- Shaft from the rotating face to the final stage sun gear experiences largest stresses in the system. A minimum dimeter of 12 mm is used for this to ensure a safety factor of against fatigue failure of > 1.5.
- Casing made from nylon for manufacture by injection moulding. Internal ribbing results in high fracture toughness, protecting against fracture failure from dropping. Additionally assists injection moulding process.