

Q-Shift Gearbox Technology

Partnering Opportunity

Q-Shift is a high performance low cost gear change technology. It uses simple dog clutch components to pass the driving torque directly from one gear to the next, without passing through a neutral state. Its sequential shift event is controlled mechanically via a simple barrel arrangement. Additional patents in the portfolio take this concept further, including a version which seamlessly multiplies the number of ratios.

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Partnering Overview

- Licensing opportunity
- Patent acquisition opportunity

Benefits

- Rapid seamless up-shifting under full load and seamless down-shifting under engine braking
- High efficiency; no de-clutching or loss of torque during shifts
- Reduced part count and complexity compared to a manual synchromesh transmission
- Smaller, lighter and significantly cheaper than Automatics and Dual Clutch Transmissions
- Scalable from 2-15 ratios for light or heavy duty use

The 'torque hand over' process used in the Q-Shift gearbox provides the ultimate shift performance as achieved by current Formula 1 'suicide shift' gearboxes. However the separation of forward and reverse engagement, combined with a simple mechanically shift mechanism protects the gearbox and provides reliable shifts, allowing manual operation without electronic control. This technology is highly applicable to motor sport as well as road use.

Demonstrator

Acceleration Performance benefits were immediately realised using a Caterham demonstration vehicle. 0 to 60mph time was reduced from 5.9 seconds to 5.3 seconds. Acceleration time is reduced because the torque hand over shift is made without backing off the throttle, without going through neutral and without a dip in output torque.

Q-Shift – Core gearbox for high performance low cost automated transmissions.

A Q-Shift gearbox combined with low cost shift and clutch actuators, plus electronic control can provide a high performance alternative to automated manual transmissions (AMT). This provides a low cost fully automatic solution applicable to passenger cars and commercial vehicles. The Q-Shift torque handover function provides rapid power maintained shifts in comparison with the long shift times of most AMTs. A determined amount of clutch slip is controlled as shifts occur to absorb impulse from engine speed changes, optimising shift quality at varying speeds and power. The shift mechanism allows for rapid power on down shifts with simple clutch control.

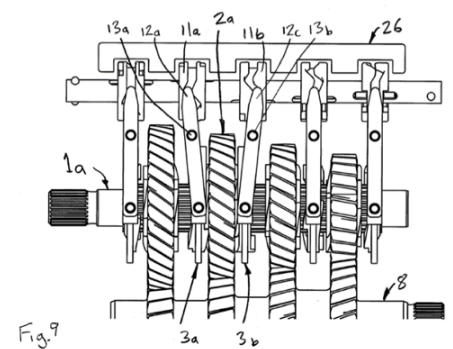
Q-Shift – High number of ratios achievable in a compact package

A multi shaft, range changing version of Q-Shift can provide high numbers of ratios with increased spread in a compact package. The unique configuration allows torque handover shifts even for range change shifts. This technology offer solutions for low power to weight vehicles, for example a 4 x 2, 8 speed gearbox for low cost passenger cars and light commercial vehicles, up to 3 x 5, 15 speed transmission for heavy trucks.



Patent List

QinetiQ Ref.	Patent Title	Priority Date	Countries (minimum Published)	Publication Number
P7846	Drive Member Selection	25/09/2012	CN, DE, ES, FR, GB, IN, IT, JP, US	WO2014049317 EP2901045B1 US10428941B2
P7912	Gearbox Improvements	10/10/2014	CN, EP, HK, IN, US	WO2016055304
P7923	Gear Ratio Shift Management	03/06/2015	GB, HK	WO2016193027
P7926	Shifting Apparatus	24/07/2015	CN, EP, IN, US, HK, JP	WO2017016869 EP3325854B1 US10408345B2
P7928	A Transmission	05/09/2016	CN, EP, IN, WO	WO2018042057
P7935	A Transmission	24/03/2016	CN, EP, IN, JP, WO	WO2017162826



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