

# Tri-Energy Source Hybrid Vehicle Powertrain

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## ABSTRACT

Researchers at the University of California, Davis have developed a tri-energy source (TES) hybrid vehicle powertrain consisting of three different propulsion systems including: (i) an internal combustion engine (ICE); (ii) an electric motor and battery and; (iii) a flywheel and continuously variable transmission (CVT).

## FULL DESCRIPTION

Increasing fuel costs and tightening emissions regulations have pushed researchers in the automotive industry to develop alternative energy technologies that can replace conventional ICE systems. While some researchers focus on singular alternative energy vehicle powertrains such as pure electric powertrains, many researchers see the benefit in developing hybrid powertrains that incorporate ICE and alternative energy sources.

Researchers at the University of California, Davis have developed a TES hybrid vehicle powertrain consisting of three different propulsion systems including: (i) an ICE; (ii) an electric motor and battery and; (iii) a flywheel and CVT. The primary and secondary propulsion systems, consisting of an ICE and electric motor, provide continuous power to the drive train while operating at nearly optimal states. The third propulsion system encompasses a dedicated short-term energy storage system (SESS), designed for load leveling and power surges.

## APPLICATIONS

- ▶ Alternative energy vehicle powertrains and energy systems

## FEATURES/BENEFITS

- ▶ Ability to split power among three energy sources
- ▶ Additional flywheel SESS is low cost, low weight, high power and compact

## PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	<a href="#">10,906,385</a>	02/02/2021	2016-377
Patent Cooperation Treaty	Published Application	<a href="#">2017/223524 A1</a>	12/28/2017	2016-377

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## OTHER INFORMATION

### KEYWORDS

alternative energy  
 vehicle, hybrid vehicle,  
 hybrid powertrains, tri-  
 energy powertrains

### CATEGORIZED AS

- ▶ **Engineering**
  - ▶ Engineering
  - ▶ Other
- ▶ **Transportation**
  - ▶ Alternative Propulsion
  - ▶ Automotive
  - ▶ Other

### RELATED CASES

2016-377-0

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