### CPC - COOPERATIVE PATENT CLASSIFICATION

**Y02**

**GENERAL TAGGING OF NEW TECHNOLOGICAL DEVELOPMENTS; GENERAL TAGGING OF CROSS-SECTIONAL TECHNOLOGIES SPANNING OVER SEVERAL SECTIONS OF THE IPC; TECHNICAL SUBJECTS COVERED BY FORMER USPC CROSS-REFERENCE ART COLLECTIONS [XRACs] AND DIGESTS**

(NOTES omitted)

**Y02T**

**TECHNOLOGIES OR APPLICATIONS FOR MITIGATION OR ADAPTATION AGAINST CLIMATE CHANGE**

(NOTES omitted)

**Y02T**

**CLIMATE CHANGE MITIGATION TECHNOLOGIES RELATED TO TRANSPORTATION**

<table>
<thead>
<tr>
<th>10/00</th>
<th>Road transport of goods or passengers</th>
</tr>
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<tbody>
<tr>
<td>10/10</td>
<td>Internal combustion engine [ICE] based vehicles</td>
</tr>
<tr>
<td>10/12</td>
<td>Technologies for the improvement of indicated efficiency of a conventional ICE</td>
</tr>
<tr>
<td>10/121</td>
<td>Adding non fuel substances or small quantities of secondary fuel to fuel, air or fuel/air mixture</td>
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<tr>
<td>10/123</td>
<td>Fuel injection</td>
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<td>10/125</td>
<td>Combustion chambers and charge mixing enhancing inside the combustion chamber</td>
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<tr>
<td>10/126</td>
<td>Acting upon fuel or oxidizing compound, e.g. pre-treatment by catalysts, ultrasound or electricity</td>
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<tr>
<td>10/128</td>
<td>Methods of operating, e.g. homogeneous charge compression ignition [HCCI], premixed charge compression ignition [PCCI]</td>
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<tr>
<td>10/14</td>
<td>Technologies for the improvement of mechanical efficiency of a conventional ICE</td>
</tr>
<tr>
<td>10/142</td>
<td>Methods of operating, e.g. Atkinson cycle, Ericsson</td>
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<tr>
<td>10/144</td>
<td>Non naturally aspirated engines, e.g. turbocharging, supercharging</td>
</tr>
<tr>
<td>10/146</td>
<td>Charge mixing enhancing outside the combustion chamber</td>
</tr>
<tr>
<td>10/148</td>
<td>Downsizing or downspeeding</td>
</tr>
<tr>
<td>10/16</td>
<td>Energy recuperation from low temperature heat sources of the ICE to produce additional power</td>
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<tr>
<td>10/163</td>
<td>Turbocompound engines</td>
</tr>
<tr>
<td>10/166</td>
<td>Waste heat recovering cycles or thermoelectric systems</td>
</tr>
<tr>
<td>10/17</td>
<td>Non-reciprocating piston engines, e.g. rotating motors</td>
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<tr>
<td>10/18</td>
<td>Varying inlet or exhaust valve operating characteristics</td>
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<tr>
<td>10/20</td>
<td>Exhaust after-treatment</td>
</tr>
<tr>
<td>10/22</td>
<td>Three way catalyst technology, i.e. oxidation or reduction at stoichiometric equivalence ratio</td>
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<tr>
<td>10/24</td>
<td>Selective Catalytic Reactors for reduction in oxygen rich atmosphere</td>
</tr>
<tr>
<td>10/26</td>
<td>Thermal conditioning of exhaust after-treatment</td>
</tr>
<tr>
<td>10/30</td>
<td>Use of alternative fuels</td>
</tr>
<tr>
<td>10/32</td>
<td>Gaseous fuels</td>
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<tr>
<td>10/34</td>
<td>Non-gaseous fuels</td>
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<tr>
<td>10/36</td>
<td>Multiple fuels, e.g. multi fuel engines</td>
</tr>
</tbody>
</table>

| 10/40 | Engine management systems |
| 10/42 | controlling air supply |
| 10/44 | controlling fuel supply |
| 10/46 | controlling ignition |
| 10/47 | Exhaust feedback |
| 10/48 | Switching off the internal combustion engine, e.g. stop and go |
| 10/50 | Intelligent control systems, e.g. conjoint control |
| 10/52 | relating to internal combustion engine fuel consumption |
| 10/54 | relating to internal combustion engine emissions |
| 10/56 | Optimising drivetrain operating point |
| 10/60 | Other road transportation technologies with climate change mitigation effect |
| 10/62 | Hybrid vehicles |
| 10/6204 | using ICE and mechanical energy storage, e.g. flywheel (mechanical storage units for electromobility in general Y02T 10/7027) |
| 10/6208 | using ICE and fluidic energy storage, e.g. pressure accumulator |
| 10/6213 | using ICE and electric energy storage, i.e. battery, capacitor (battery for energy storage for electromobility in general Y02T 10/7005; capacitor technology for energy storage for electromobility in general Y02T 10/7022) |
| 10/6217 | of the series type or range extenders |
| 10/6221 | of the parallel type |
| 10/6226 | Motor-assist type |
| 10/623 | of the series-parallel type |
| 10/6234 | Series-parallel switching type |
| 10/6239 | Differential gearing distribution type |
| 10/6243 | Electrical distribution type |
| 10/6247 | with motor integrated into gearbox |
| 10/6252 | connected or connectable to input shaft of gearing |
| 10/6256 | connected or connectable to intermediate shaft of gearing |
| 10/626 | Motor between output shaft of gearing and driven wheels |
| 10/6265 | Driving a plurality of axles |
| 10/6269 | provided with means for plug-in |
| 10/6273 | Combining different types of energy storage |
10/6278 . . . . Battery and capacitor
10/6282 . . . . Battery and mechanical or fluidic energy storage
10/6286 . . . . Control systems for power distribution between ICE and other motor or motors
10/6291 . . . . Predicting future driving conditions
10/6295 . . . . Other types of combustion engine
10/64 . . . . Electric machine technologies for applications in electromobility
10/641 . . . . characterised by aspects of the electric machine
10/642 . . . . Control strategies of electric machines for automotive applications
10/643 . . . . Vector control
10/644 . . . . Control strategies for ac machines other than vector control
10/645 . . . . Control strategies for dc machines
10/646 . . . . With two or more electric drive machines
10/70 . . . . Energy storage for electromobility (hydrogen internal combustion engines Y02T 90/42; fuel cell powered electric vehicles Y02T 90/34)
10/7005 . . . . Batteries
10/7011 . . . . Lithium ion battery
10/7016 . . . . Lead acid battery
10/7022 . . . . Capacitors, supercapacitors or ultracapacitors
10/7027 . . . . Mechanical energy storage devices
10/7033 . . . . Fly wheels
10/7038 . . . . Energy storage management
10/7044 . . . . Controlling the battery or capacitor state of charge
10/705 . . . . Controlling vehicles with one battery or one capacitor only
10/7055 . . . . Controlling vehicles with more than one battery or more than one capacitor
10/7061 . . . . the batteries or capacitors being of the same voltage
10/7066 . . . . the batteries or capacitors being of a different voltage
10/7072 . . . . Electromobility specific charging systems or methods for batteries, ultracapacitors, supercapacitors or double-layer capacitors (efficient charging systems for batteries, ultracapacitors, supercapacitors or double-layer capacitors in road transportation in general Y02T 10/92)
10/7077 . . . . on board the vehicle
10/7083 . . . . with the energy being of renewable origin
10/7088 . . . . Charging stations
10/7094 . . . . with the energy being of renewable origin
10/72 . . . . Electric energy management in electromobility
10/7208 . . . . Electric power conversion within the vehicle
10/7216 . . . . DC to DC power conversion
10/7225 . . . . Using step - up or boost converters
10/7233 . . . . Using step - down or buck converters
10/7241 . . . . DC to AC or AC to DC power conversion
10/725 . . . . AC to AC power conversion
10/7258 . . . . Optimisation of vehicle performance
10/7275 . . . . Desired performance achievement
10/7283 . . . . Optimisation of energy management
10/7291 . . . . by route optimisation processing
10/76 . . . . Transmission of mechanical power
10/80 . . . . Technologies aiming to reduce greenhouse gases emissions common to all road transportation technologies
10/82 . . . . Elements for improving aerodynamics
10/84 . . . . Data processing systems or methods, management, administration
10/86 . . . . Optimisation of rolling resistance, e.g. weight reduction
10/862 . . . . Tyres, e.g. materials
10/865 . . . . Bearings
10/88 . . . . Optimized components or subsystems, e.g. lighting, actively controlled glasses
10/90 . . . . Energy harvesting concepts as power supply for auxiliaries' energy consumption, e.g. photovoltaic sun-roof
10/92 . . . . Energy efficient charging or discharging systems for batteries, ultracapacitors, supercapacitors or double-layer capacitors specially adapted for vehicles

30/00 Transportation of goods or passengers via railways
30/10 . . . . Energy recovery technologies concerning the propulsion system in locomotives or motor railcars
30/12 . . . . In electric locomotives or motor railcars with electric accumulators, e.g. involving regenerative braking
30/14 . . . . In locomotives or motor railcars with pneumatic accumulators
30/16 . . . . In locomotives or motor railcars with two or different kinds or types of engine
30/18 . . . . Specific power storing devices
30/30 . . . . Other technological aspects of railway vehicles
30/32 . . . . Reducing air resistance by modifying contour
30/34 . . . . Composite; Lightweight materials
30/36 . . . . Device for using the energy of the movements of the vehicle
30/38 . . . . Bogie frames comprising parts made from fiber-reinforced matrix material
30/40 . . . . Applications of solar cells or heat pipes, e.g. on ski-lift cabins or carriages for passengers or goods
30/42 . . . . concerning heating, ventilating or air conditioning

50/00 Aeronautics or air transport
50/10 . . . . Drag reduction
50/12 . . . . Overall configuration, shape or profile of fuselage or wings
50/14 . . . . Adaptive structures, e.g. morphing wings
50/16 . . . . by influencing airflow
50/162 . . . . by generating or controlling vortexes
50/164 . . . . at the wing tip, e.g. winglets
50/166 . . . . by influencing the boundary layer
50/30 . . . . Wing lift efficiency
50/32 . . . . Optimised high lift wing systems
50/34 . . . . Helicopter rotor blades lift efficiency
50/40 . . . . Weight reduction
50/42 . . . . Airframe
50/43 . . . . Composites
50/44 . . . . Design measures
50/46 . . . . Interior
50/50 . . . . On board measures aiming to increase energy efficiency
50/52 . . . . concerning the electrical systems
50/53 . . . . Energy recovery, conversion or storage systems
50/54 . . . . All-electric or substantially electric architectures
50/55 . . . . Solar cells as on-board power source
70/00 Maritime or waterways transport

70/10 . Measures concerning design or construction of watercraft hulls

70/12 . Improving hydrodynamics of hull
70/121 . Reducing surface friction
70/122 . Air lubrication, air cavity systems
70/123 . Hull coatings, e.g. biomimicry
70/125 . Lower wave resistance
70/126 . Bow shape
70/127 . improving wake pattern
70/128 . reducing the interaction between hull and propeller

70/14 . Construction of hull
70/143 . Materials, e.g. ultra light steels, composites
70/146 . Energy efficient measures related to fabrication or assembly of hull

70/30 . Measures at the maintenance or repair stage specially aiming at green house gasses emissions reduction

70/32 . Surface or tank cleaning and treatment operations
70/34 . Improved operation of fossil fuel transfer, e.g. ship-to-ship oil or gas transfer

70/36 . Handling waste
70/50 . Measures to reduce greenhouse gas emissions related to the propulsion system

70/52 . Propulsion power plant
70/5209 . Relating to type of fuel
70/5218 . Less carbon-intensive fuels, e.g. natural gas, biofuels

70/5227 . Non-conventional fuels, e.g. nuclear
70/5236 . Renewable or hybrid-electric solutions
70/5245 . using solar generated electricity, e.g. photovoltaics
70/5254 . using wind motor to generate electricity
70/5263 . Other measures to increase efficiency of the power plant

70/5272 . Engine monitoring and control
70/5281 . Waste heat recovery
70/529 . Reducing auxiliary power

70/54 . Propeller
70/542 . Improved propeller design
70/545 . Recovery of rotational energy
70/547 . Wake equalizing arrangements
70/56 . Jets
70/58 . Propulsion by direct use of wind
70/583 . Energy efficient technologies involving sails
70/586 . Kites
70/59 . Other propulsion concepts for reducing greenhouse gas emissions, e.g. wave-powered

70/70 . Technologies for a more efficient operation of the waterborne vessel not otherwise provided for

70/72 . Related to heating, ventilation, air conditioning, or refrigeration systems

70/74 . Integrating maritime voyage control
70/742 . Speed reduction
70/745 . Weather routing

70/747 . Course optimization
70/80 . Measures concerning recycling, retrofitting or dismantling of waterborne vessels

70/90 . Port equipment or systems reducing GHG emissions

90/00 Enabling technologies or technologies with a potential or indirect contribution to GHG emissions mitigation

90/10 . Technologies related to electric vehicle charging
90/12 . Electric charging stations
90/121 . by conductive energy transmission
90/122 . by inductive energy transmission
90/124 . by exchange of energy storage elements
90/125 . Alignment between the vehicle and the charging station

90/127 . Converters or inverters for charging
90/128 . Energy exchange control or determination
90/14 . Plug-in electric vehicles
90/16 . Information or communication technologies improving the operation of electric vehicles
90/161 . Navigation
90/162 . Position determination
90/163 . Information or communication technologies related to charging of electric vehicle
90/167 . Systems integrating technologies related to power network operation and communication or information technologies for supporting the interoperability of electric or hybrid vehicles, i.e. smartgrids as interface for battery charging of electric vehicles [EV] or hybrid vehicles [HEV] (power aggregation of EV or HEV Y02E 60/721)

NOTE
Documents tagged under Y02T 90/167 are concurrently tagged also under Y04S 30/10

90/168 . Remote or cooperative charging operation
90/169 . Aspects supporting the interoperability of electric or hybrid vehicles, e.g. recognition, authentication, identification or billing

90/30 . Application of fuel cell technology to transportation
90/32 . Fuel cells specially adapted to transport applications, e.g. automobile, bus, ship
90/34 . Fuel cell powered electric vehicles [FCEV]
90/36 . Fuel cells as on-board power source in aeronautics
Fuel cells as on-board power source in waterborne transportation

Application of hydrogen technology to transportation

Hydrogen as fuel for road transportation

Hydrogen as fuel in aeronautics

Hydrogen as fuel in waterborne transportation

Computer aided design [CAD] for improving the mechanical performance in the sector of transportation, e.g. improvement of aerodynamics, noise or vibration reduction, tyre design