

# CPC COOPERATIVE PATENT CLASSIFICATION

## Y 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)

## Y02 TECHNOLOGIES OR APPLICATIONS FOR MITIGATION OR ADAPTATION AGAINST CLIMATE CHANGE

(NOTES omitted)

## Y02T CLIMATE CHANGE MITIGATION TECHNOLOGIES RELATED TO TRANSPORTATION

|              |  |         |   |
|--------------|--|---------|---|
| <b>10/00</b> | <b>Road transport of goods or passengers</b>   | 10/40   | . . Engine management systems   |
| 10/10        | . Internal combustion engine [ICE] based vehicles  | 10/42   | . . . controlling air supply  |
| 10/12        | . . Technologies for the improvement of indicated efficiency of a conventional ICE   | 10/44   | . . . controlling fuel supply   |
| 10/121       | . . . Adding non fuel substances or small quantities of secondary fuel to fuel, air or fuel/air mixture                      | 10/46   | . . . controlling ignition  |
| 10/123       | . . . Fuel injection   | 10/47   | . . . Exhaust feedback  |
| 10/125       | . . . Combustion chambers and charge mixing enhancing inside the combustion chamber  | 10/48   | . . . Switching off the internal combustion engine, e.g. stop and go  |
| 10/126       | . . . Acting upon fuel or oxidizing compound, e.g. pre-treatment by catalysts, ultrasound or electricity                     | 10/50   | . . Intelligent control systems, e.g. conjoint control  |
| 10/128       | . . . Methods of operating, e.g. homogeneous charge compression ignition [HCCI], premixed charge compression ignition [PCCI] | 10/52   | . . . relating to internal combustion engine fuel consumption   |
| 10/14        | . . Technologies for the improvement of mechanical efficiency of a conventional ICE  | 10/54   | . . . relating to internal combustion engine emissions  |
| 10/142       | . . . Methods of operating, e.g. Atkinson cycle, Ericsson  | 10/56   | . . . Optimising drivetrain operating point   |
| 10/144       | . . . Non naturally aspirated engines, e.g. turbocharging, supercharging   | 10/60   | . Other road transportation technologies with climate change mitigation effect  |
| 10/146       | . . . Charge mixing enhancing outside the combustion chamber   | 10/62   | . . Hybrid vehicles   |
| 10/148       | . . . Downsizing or downspeeding   | 10/6204 | . . . using ICE and mechanical energy storage, e.g. flywheel ( <a href="#">mechanical storage units for electromobility in general Y02T 10/7027</a> )   |
| 10/16        | . . Energy recuperation from low temperature heat sources of the ICE to produce additional power                             | 10/6208 | . . . using ICE and fluidic energy storage, e.g. pressure accumulator   |
| 10/163       | . . . Turbocompound engines  | 10/6213 | . . . using ICE and electric energy storage, i.e. battery, capacitor ( <a href="#">battery for energy storage for electromobility in general Y02T 10/7005</a> ; <a href="#">capacitor technology for energy storage for electromobility in general Y02T 10/7022</a> ) |
| 10/166       | . . . Waste heat recovering cycles or thermoelectric systems   | 10/6217 | . . . . of the series type or range extenders   |
| 10/17        | . . Non-reciprocating piston engines, e.g. rotating motors   | 10/6221 | . . . . of the parallel type  |
| 10/18        | . . Varying inlet or exhaust valve operating characteristics   | 10/6226 | . . . . . Motor-assist type   |
| 10/20        | . . Exhaust after-treatment  | 10/623  | . . . . of the series-parallel type   |
| 10/22        | . . . Three way catalyst technology, i.e. oxidation or reduction at stoichiometric equivalence ratio                         | 10/6234 | . . . . . Series-parallel switching type  |
| 10/24        | . . . Selective Catalytic Reactors for reduction in oxygen rich atmosphere   | 10/6239 | . . . . . Differential gearing distribution type  |
| 10/26        | . . . Thermal conditioning of exhaust after-treatment  | 10/6243 | . . . . . Electrical distribution type  |
| 10/30        | . . Use of alternative fuels   | 10/6247 | . . . . . with motor integrated into gearbox  |
| 10/32        | . . . Gaseous fuels  | 10/6252 | . . . . . connected or connectable to input shaft of gearing  |
| 10/34        | . . . Non-gaseous fuels  | 10/6256 | . . . . . connected or connectable to intermediate shaft of gearing   |
| 10/36        | . . . Multiple fuels, e.g. multi fuel engines  | 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  | 10/82        | . . Elements for improving aerodynamics  |
| 10/6282 | . . . . Battery and mechanical or fluidic energy storage   | 10/84        | . . Data processing systems or methods, management, administration   |
| 10/6286 | . . . Control systems for power distribution between ICE and other motor or motors   | 10/86        | . . Optimisation of rolling resistance, e.g. weight reduction  |
| 10/6291 | . . . . Predicting future driving conditions   | 10/862       | . . . Tyres, e.g. materials  |
| 10/6295 | . . . Other types of combustion engine   | 10/865       | . . . Bearings   |
| 10/64   | . . Electric machine technologies for applications in electromobility  | 10/88        | . . Optimized components or subsystems, e.g. lighting, actively controlled glasses   |
| 10/641  | . . . characterised by aspects of the electric machine   | 10/90        | . . Energy harvesting concepts as power supply for auxiliaries' energy consumption, e.g. photovoltaic sun-roof   |
| 10/642  | . . . Control strategies of electric machines for automotive applications  | 10/92        | . . Energy efficient charging or discharging systems for batteries, ultracapacitors, supercapacitors or double-layer capacitors specially adapted for vehicles |
| 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   | <b>30/00</b> | <b>Transportation of goods or passengers via railways</b>  |
| 10/70   | . . Energy storage for electromobility ( <a href="#">hydrogen internal combustion engines Y02T 90/42</a> ; <a href="#">fuel cell powered electric vehicles Y02T 90/34</a> )  | 30/10        | . . Energy recovery technologies concerning the propulsion system in locomotives or motor railcars   |
| 10/7005 | . . . Batteries  | 30/12        | . . In electric locomotives or motor railcars with electric accumulators, e.g. involving regenerative braking  |
| 10/7011 | . . . . Lithium ion battery  |              |  |
| 10/7016 | . . . . Lead acid battery  | 30/14        | . . In locomotives or motor railcars with pneumatic accumulators   |
| 10/7022 | . . . Capacitors, supercapacitors or ultracapacitors   | 30/16        | . . In locomotives or motor railcars with two or different kinds or types of engine  |
| 10/7027 | . . . Mechanical energy storage devices  | 30/18        | . . Specific power storing devices   |
| 10/7033 | . . . . Fly wheels   | 30/30        | . . Other technological aspects of railway vehicles  |
| 10/7038 | . . . Energy storage management  | 30/32        | . . Reducing air resistance by modifying contour   |
| 10/7044 | . . . . Controlling the battery or capacitor state of charge   | 30/34        | . . Composite; Lightweight materials   |
| 10/705  | . . . . Controlling vehicles with one battery or one capacitor only  | 30/36        | . . Device for using the energy of the movements of the vehicle  |
| 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  | 30/38        | . . Bogie frames comprising parts made from fiber-reinforced matrix material   |
| 10/7066 | . . . . . the batteries or capacitors being of a different voltage   | 30/40        | . . Applications of solar cells or heat pipes, e.g. on ski-lift cabins or carriages for passengers or goods  |
| 10/7072 | . . . Electromobility specific charging systems or methods for batteries, ultracapacitors, supercapacitors or double-layer capacitors ( <a href="#">efficient charging systems for batteries, ultracapacitors, supercapacitors or double-layer capacitors in road transportation in general Y02T 10/92</a> ) | 30/42        | . . concerning heating, ventilating or air conditioning  |
|         |  | <b>50/00</b> | <b>Aeronautics or air transport</b>  |
| 10/7077 | . . . . on board the vehicle   | 50/10        | . . Drag reduction   |
| 10/7083 | . . . . . with the energy being of renewable origin  | 50/12        | . . Overall configuration, shape or profile of fuselage or wings   |
| 10/7088 | . . . . Charging stations  |              |  |
| 10/7094 | . . . . . with the energy being of renewable origin  | 50/14        | . . Adaptive structures, e.g. morphing wings   |
| 10/72   | . . Electric energy management in electromobility  | 50/16        | . . by influencing airflow   |
| 10/7208 | . . . Electric power conversion within the vehicle   | 50/162       | . . . by generating or controlling vortexes  |
| 10/7216 | . . . . DC to DC power conversion  | 50/164       | . . . . at the wing tip, e.g. winglets   |
| 10/7225 | . . . . . Using step - up or boost converters  | 50/166       | . . . by influencing the boundary layer  |
| 10/7233 | . . . . . Using step - down or buck converters   | 50/30        | . . Wing lift efficiency   |
| 10/7241 | . . . . DC to AC or AC to DC power conversion  | 50/32        | . . Optimised high lift wing systems   |
| 10/725  | . . . . AC to AC power conversion  | 50/34        | . . Helicopter rotor blades lift efficiency  |
| 10/7258 | . . . Optimisation of vehicle performance  | 50/40        | . . Weight reduction   |
| 10/7275 | . . . . Desired performance achievement  | 50/42        | . . Airframe   |
| 10/7283 | . . . . Optimisation of energy management  | 50/43        | . . . Composites   |
| 10/7291 | . . . . by route optimisation processing   | 50/44        | . . . Design measures  |
| 10/76   | . . Transmission of mechanical power   | 50/46        | . . Interior   |
| 10/80   | . . Technologies aiming to reduce greenhouse gasses emissions common to all road transportation technologies   | 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   |

|              |  |              |  |
|--------------|--|--------------|--|
| 50/56        | . . Thermal management, e.g. environmental control systems [ECS] or cooling                              | 70/54        | . . Propeller  |
| 50/60        | . Efficient propulsion technologies  | 70/542       | . . . Improved propeller design  |
| 50/62        | . . Electrical   | 70/545       | . . . Recovery of rotational energy  |
| 50/64        | . . Hybrid   | 70/547       | . . . Wake equalizing arrangements   |
| 50/66        | . . Propellers   | 70/56        | . . Jets   |
| 50/67        | . . Relevant aircraft propulsion technologies  | 70/58        | . . Propulsion by direct use of wind   |
| 50/671       | . . . Measures to reduce the propulsor weight  | 70/583       | . . . Energy efficient technologies involving sails  |
| 50/672       | . . . . using composites   | 70/586       | . . . Kites  |
| 50/673       | . . . Improving the blades aerodynamics  | 70/59        | . . Other propulsion concepts for reducing greenhouse gas emissions, e.g. wave-powered   |
| 50/675       | . . . Enabling an increased combustion temperature by cooling  | 70/70        | . Technologies for a more efficient operation of the waterborne vessel not otherwise provided for  |
| 50/676       | . . . . Blades cooling   | 70/72        | . . Related to heating, ventilation, air conditioning, or refrigeration systems  |
| 50/6765      | . . . Enabling an increased combustion temperature by thermal barrier coatings                           | 70/74        | . . Integrating maritime voyage control  |
| 50/677       | . . . Controlling the propulsor to control the emissions   | 70/742       | . . . Speed reduction  |
| 50/678       | . . . using fuels of non-fossil origin   | 70/745       | . . . Weather routing  |
| 50/80        | . Energy efficient operational measures  | 70/747       | . . . Course optimization  |
| 50/82        | . . Related to ground operations   | 70/80        | . Measures concerning recycling, retrofitting or dismantling of waterborne vessels   |
| 50/823       | . . . Aircraft equipment, e.g. wheel embedded  | 70/90        | . Port equipment or systems reducing GHG emissions   |
| 50/826       | . . . Towing equipment   |              |  |
| 50/84        | . . Related to management of trajectory and mission  |              |  |
| <b>70/00</b> | <b>Maritime or waterways transport</b>   | <b>90/00</b> | <b>Enabling technologies or technologies with a potential or indirect contribution to GHG emissions mitigation</b>   |
| 70/10        | . Measures concerning design or construction of watercraft hulls   | 90/10        | . Technologies related to electric vehicle charging  |
| 70/12        | . . Improving hydrodynamics of hull  | 90/12        | . . Electric charging stations   |
| 70/121       | . . . Reducing surface friction  | 90/121       | . . . by conductive energy transmission  |
| 70/122       | . . . . Air lubrication, air cavity systems  | 90/122       | . . . by inductive energy transmission   |
| 70/123       | . . . . Hull coatings, e.g. biomimicry   | 90/124       | . . . by exchange of energy storage elements   |
| 70/125       | . . . Lower wave resistance  | 90/125       | . . . Alignment between the vehicle and the charging station   |
| 70/126       | . . . . Bow shape  | 90/127       | . . . Converters or inverters for charging   |
| 70/127       | . . . improving wake pattern   | 90/128       | . . . Energy exchange control or determination   |
| 70/128       | . . . . reducing the interaction between hull and propeller  | 90/14        | . . Plug-in electric vehicles  |
| 70/14        | . . Construction of hull   | 90/16        | . . Information or communication technologies improving the operation of electric vehicles   |
| 70/143       | . . . Materials, e.g. ultra light steels, composites   | 90/161       | . . . Navigation   |
| 70/146       | . . . Energy efficient measures related to fabrication or assembly of hull                               | 90/162       | . . . . Position determination   |
| 70/30        | . Measures at the maintenance or repair stage specially aiming at green house gasses emissions reduction | 90/163       | . . . Information or communication technologies related to charging of electric vehicle  |
| 70/32        | . . Surface or tank cleaning and treatment operations  | 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 <a href="#">Y02E 60/721</a> ) |
| 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   | 90/168       | . . . . Remote or cooperative charging operation   |
| 70/5236      | . . . Renewable or hybrid-electric solutions   | 90/169       | . . . . Aspects supporting the interoperability of electric or hybrid vehicles, e.g. recognition, authentication, identification or billing  |
| 70/5245      | . . . . using solar generated electricity, e.g. photovoltaics  | 90/30        | . Application of fuel cell technology to transportation  |
| 70/5254      | . . . . using wind motor to generate electricity   | 90/32        | . . Fuel cells specially adapted to transport applications, e.g. automobile, bus, ship   |
| 70/5263      | . . . Other measures to increase efficiency of the power plant   | 90/34        | . . Fuel cell powered electric vehicles [FCEV]   |
| 70/5272      | . . . . Engine monitoring and control  | 90/36        | . . Fuel cells as on-board power source in aeronautics   |
| 70/5281      | . . . . Waste heat recovery  |              |  |
| 70/529       | . . . . Reducing auxiliary power   |              |  |

**NOTE**

Documents tagged under [Y02T 90/167](#) are concurrently tagged also under [Y04S 30/10](#)

## Y02T

- 90/38 . . Fuel cells as on-board power source in waterborne transportation
- 90/40 . Application of hydrogen technology to transportation
- 90/42 . . Hydrogen as fuel for road transportation
- 90/44 . . Hydrogen as fuel in aeronautics
- 90/46 . . Hydrogen as fuel in waterborne transportation
- 90/50 . 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