

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)

Y02E REDUCTION OF GREENHOUSE GAS [GHG] EMISSIONS, RELATED TO ENERGY GENERATION, TRANSMISSION OR DISTRIBUTION

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|--------------|---|--------------|--|
| 10/00 | Energy generation through renewable energy sources | 10/546 | . . . Polycrystalline silicon PV cells |
| | | 10/547 | . . . Monocrystalline silicon PV cells |
| 10/10 | . Geothermal energy | 10/548 | . . . Amorphous silicon PV cells |
| 10/12 | . . Earth coil heat exchangers | 10/549 | . . . organic PV cells |
| 10/125 | . . . Compact tube assemblies, e.g. geothermal probes | 10/56 | . . Power conversion electric or electronic aspects |
| | | 10/563 | . . . for grid-connected applications |
| 10/14 | . . Systems injecting medium directly into ground, e.g. hot dry rock system, underground water | 10/566 | . . . concerning power management inside the plant, e.g. battery charging/discharging, economical operation, hybridisation with other energy sources |
| 10/16 | . . Systems injecting medium into a closed well | | |
| 10/18 | . . Systems exchanging heat with fluids in pipes, e.g. fresh water or waste water | 10/58 | . . . Maximum power point tracking [MPPT] systems |
| 10/20 | . Hydro energy | | |
| 10/22 | . . Conventional, e.g. with dams, turbines and waterwheels | 10/60 | . Thermal-PV hybrids |
| | | 10/70 | . Wind energy |
| 10/223 | . . . Turbines or waterwheels, e.g. details of the rotor | 10/72 | . . Wind turbines with rotation axis in wind direction |
| | | 10/721 | . . . Blades or rotors |
| 10/226 | . . . Other parts or details | 10/722 | . . . Components or gearbox |
| 10/28 | . . Tidal stream or damless hydropower, e.g. sea flood and ebb, river, stream | 10/723 | . . . Control of turbines |
| | | 10/725 | . . . Generator or configuration |
| 10/30 | . Energy from the sea (tidal stream Y02E 10/28) | 10/726 | . . . Nacelles |
| 10/32 | . . Oscillating water column [OWC] | 10/727 | . . . Offshore towers |
| 10/34 | . . Ocean thermal energy conversion [OTEC] | 10/728 | . . . Onshore towers |
| 10/36 | . . Salinity gradient | 10/74 | . . Wind turbines with rotation axis perpendicular to the wind direction |
| 10/38 | . . Wave energy or tidal swell, e.g. Pelamis-type | | |
| 10/40 | . Solar thermal energy | 10/76 | . . Power conversion electric or electronic aspects |
| 10/41 | . . Tower concentrators | 10/763 | . . . for grid-connected applications |
| 10/42 | . . Dish collectors | 10/766 | . . . concerning power management inside the plant, e.g. battery charging/discharging, economical operation, hybridisation with other energy sources |
| 10/43 | . . Fresnel lenses | | |
| 10/44 | . . Heat exchange systems | | |
| 10/45 | . . Trough concentrators | | |
| 10/46 | . . Conversion of thermal power into mechanical power, e.g. Rankine, Stirling solar thermal engines | 20/00 | Combustion technologies with mitigation potential |
| | | 20/10 | . Combined combustion |
| 10/465 | . . . Thermal updraft | 20/12 | . . Heat utilisation in combustion or incineration of waste |
| 10/47 | . . Mountings or tracking | | |
| 10/50 | . Photovoltaic [PV] energy | 20/14 | . . Combined heat and power generation [CHP] |
| 10/52 | . . PV systems with concentrators | 20/16 | . . Combined cycle power plant [CCPP], or combined cycle gas turbine [CCGT] |
| 10/54 | . . Material technologies | | |
| 10/541 | . . . CuInSe ₂ material PV cells | 20/18 | . . . Integrated gasification combined cycle [IGCC] |
| 10/542 | . . . Dye sensitized solar cells | 20/185 | combined with carbon capture and storage [CCS] |
| 10/543 | . . . Solar cells from Group II-VI materials | | |
| 10/544 | . . . Solar cells from Group III-V materials | 20/30 | . Technologies for a more efficient combustion or heat usage |
| 10/545 | . . . Microcrystalline silicon PV cells | 20/32 | . . Direct CO ₂ mitigation |

- 20/322 . . . Use of synair, i.e. a mixture of recycled CO₂ and pure O₂
- 20/324 . . . Use of reactants before or during combustion
- 20/326 . . . Segregation from fumes, including use of reactants downstream from combustion or deep cooling
- 20/328 . . . Controls of combustion specifically inferring on CO₂ emissions
- 20/34 . . Indirect CO₂ mitigation, i.e. by acting on non CO₂ directly related matters of the process, e.g. more efficient use of fuels
- 20/342 . . . Cold flame
- 20/344 . . . Oxyfuel combustion
- 20/346 . . . Unmixed combustion
- 20/348 . . . Air pre-heating
- 20/36 . . Heat recovery other than air pre-heating
- 20/363 . . . at fumes level
- 20/366 . . . at burner level
- 30/00 Energy generation of nuclear origin**
- 30/10 . Fusion reactors
- 30/12 . . Magnetic plasma confinement [MPC]
- 30/122 . . . Tokamaks
- 30/124 . . . Stellarators
- 30/126 . . . Other reactors with MPC
- 30/128 . . . First wall, divertor, blanket
- 30/14 . . Inertial plasma confinement
- 30/16 . . . Injection systems and targets
- 30/18 . . Low temperature fusion, e.g. "cold fusion"
- 30/30 . Nuclear fission reactors
- 30/31 . . Boiling water reactors
- 30/32 . . Pressurized water reactors
- 30/33 . . Gas cooled reactors
- 30/34 . . Fast breeder reactors
- 30/35 . . Liquid metal reactors
- 30/36 . . Pebble bed reactors
- 30/37 . . Accelerator driven reactors
- 30/38 . . Fuel
- 30/39 . . Control of nuclear reactions
- 30/40 . . Other aspects relating to nuclear fission
- 40/00 Technologies for an efficient electrical power generation, transmission or distribution**
- 40/10 . Flexible AC transmission systems [FACTS]
- 40/12 . . Static VAR compensators [SVC], static VAR generators [SVG] or static VAR systems [SVS], including thyristor-controlled reactors [TCR], thyristor-switched reactors [TSR] or thyristor-switched capacitors [TSC]
- 40/14 . . Thyristor-controlled series capacitors [TCSC]
- 40/16 . . Static synchronous compensators [STATCOM]
- 40/18 . . Unified power flow controllers [UPF] or controlled series voltage compensators
- 40/20 . Active power filtering [APF]
- 40/22 . . Non-specified or voltage-fed active power filters
- 40/24 . . Current-fed active power filters
- 40/26 . . using a multilevel or multicell converter
- 40/30 . Reactive power compensation ([Y02E 40/10 take precedence](#))
- 40/32 . . using synchronous generators
- 40/34 . . for voltage regulation
- 40/40 . Arrangements for reducing harmonics ([Y02E 40/10 - Y02E 40/30 take precedence](#))
- 40/50 . Arrangements for eliminating or reducing asymmetry in polyphase networks
- 40/60 . Superconducting electric elements or equipment or power systems integrating superconducting elements or equipment
- 40/62 . . Superconducting generators
- 40/622 . . . Superconducting synchronous generators
- 40/625 with a superconducting rotor
- 40/627 . . . Superconducting homopolar generators
- 40/64 . . Superconducting transmission lines or power lines or cables or installations thereof
- 40/641 . . . characterised by their form
- 40/642 Films or wires on bases or cores
- 40/644 Multifilaments embedded in normal conductors
- 40/645 . . . characterised by the disposition of thermal insulation
- 40/647 . . . characterised by cooling
- 40/648 . . . Installation of superconducting cables or lines
- 40/66 . . Superconducting transformers or inductors
- 40/67 . . Superconducting energy storage for power networks, e.g. SME, superconducting magnetic storage
- 40/68 . . Protective or switching arrangements for superconducting elements or equipment
- 40/69 . . Current limitation using superconducting elements, including multifunctional current limiters
- 40/70 . Systems integrating technologies related to power network operation and communication or information technologies for improving the carbon footprint of electrical power generation, transmission or distribution, i.e. smart grids as climate change mitigation technology in the energy generation sector ([smart grids relating to the energy generation sector in general, e.g. with no associated climate change mitigation effect Y04S 10/00](#))
- 40/72 . . Systems characterised by the monitoring, control or operation of energy generation units, e.g. distributed generation [DER] or load-side generation
- 40/725 . . . the energy generation units being or involving renewable energy sources
- 40/74 . . Systems characterised by the monitoring, control or operation of flexible AC transmission systems [FACTS] or power factor or reactive power compensating or correcting units
- 40/76 . . Computing methods or systems for efficient or low carbon management or operation of electric power systems
- 50/00 Technologies for the production of fuel of non-fossil origin**
- 50/10 . Biofuels
- 50/11 . . CHP turbines for biofeed
- 50/12 . . Gas turbines for biofeed
- 50/13 . . Bio-diesel
- 50/14 . . Bio-pyrolysis
- 50/15 . . Torrefaction of biomass
- 50/16 . . Cellulosic bio-ethanol
- 50/17 . . Grain bio-ethanol
- 50/18 . . Bio-alcohols produced by other means than fermentation
- 50/30 . Fuel from waste

- 50/32 . . Synthesis of alcohols or diesel from waste including a pyrolysis or gasification step
- 50/34 . . Methane
- 50/343 . . . production by fermentation of organic by-products, e.g. sludge
- 50/346 . . . from landfill gas
- 60/00 Enabling technologies or technologies with a potential or indirect contribution to GHG emissions mitigation**
- 60/10 . Energy storage
- 60/12 . . Battery technologies with an indirect contribution to GHG emissions mitigation ([battery technologies specific to electromobility Y02T 10/7005](#))
- 60/122 . . . Lithium-ion batteries
- 60/124 . . . Alkaline secondary batteries, e.g. NiCd or NiMH
- 60/126 . . . Lead-acid batteries
- 60/128 . . . Hybrid cells composed of a half-cell of a fuel-cell type and a half-cell of the secondary-cell type
- 60/13 . . Ultracapacitors, supercapacitors, double-layer capacitors
- 60/14 . . Thermal storage
- 60/142 . . . Sensible heat storage
- 60/145 . . . Latent heat storage
- 60/147 . . . Cold storage
- 60/15 . . Pressurised fluid storage
- 60/16 . . Mechanical energy storage, e.g. flywheels
- 60/17 . . Pumped storage
- 60/30 . Hydrogen technology
- 60/32 . . Hydrogen storage
- 60/321 . . . Storage of liquefied, solidified, or compressed hydrogen in containers
- 60/322 . . . Storage in caverns
- 60/324 . . . Reversible uptake of hydrogen by an appropriate medium
- 60/325 the medium being carbon
- 60/327 the medium being a metal or rare earth metal, an intermetallic compound or a metal alloy
- 60/328 the medium being an organic compound or a solution thereof
- 60/34 . . Hydrogen distribution
- 60/36 . . Hydrogen production from non-carbon containing sources
- 60/362 . . . by chemical reaction with metal hydrides, e.g. hydrolysis of metal borohydrides
- 60/364 . . . by decomposition of inorganic compounds, e.g. splitting of water other than electrolysis, ammonia borane, ammonia
- 60/366 . . . by electrolysis of water
- 60/368 by photo-electrolysis
- 60/50 . Fuel cells
- 60/52 . . characterised by type or design
- 60/521 . . . Proton Exchange Membrane Fuel Cells [PEMFC]
- 60/522 Direct Alcohol Fuel Cells [DAFC]
- 60/523 Direct Methanol Fuel Cells [DMFC]
- 60/525 . . . Solid Oxide Fuel Cells [SOFC]
- 60/526 . . . Molten Carbonate Fuel Cells [MCFC]
- 60/527 . . . Bio Fuel Cells
- 60/528 . . . Regenerative or indirect fuel cells, e.g. redox flow type batteries
- 60/56 . . integrally combined with other energy production systems
- 60/563 . . . Cogeneration of mechanical energy, e.g. integral combination of fuel cells and electric motors
- 60/566 . . . Production of chemical products inside the fuel cell; incomplete combustion
- 60/60 . Arrangements for transfer of electric power between AC networks via a high-tension DC link, HVDC transmission
- 60/70 . Systems integrating technologies related to power network operation and communication or information technologies mediating in the improvement of the carbon footprint of electrical power generation, transmission or distribution, i.e. smart grids as enabling technology in the energy generation sector ([smart grids relating to the energy generation sector in general, e.g. with no associated climate change mitigation effect Y04S 10/00](#))
- 60/72 . . Systems characterised by the monitored, controlled or operated power network elements or equipments
- 60/721 . . . the elements or equipments being or involving electric vehicles [EV] or hybrid vehicles [HEV], i.e. power aggregation of EV or HEV, vehicle to grid arrangements [V2G] ([remote or cooperative charging Y02T 90/168](#); [details associated with the interoperability in the section of transportation, e.g. vehicle recognition, authentication, identification or billing Y02T 90/169](#))
- 60/722 . . . the elements or equipments being or involving energy storage units ([for systems comprising uninterruptible power supplies or standby generators Y04S 20/12](#))
- 60/723 . . . the elements or equipments being or involving electric power substations
- 60/724 . . . the elements or equipments being or involving switches, relays or circuit breakers, e.g. intelligent electronic devices [IED]
- 60/725 . . . the elements or equipments being or involving protection elements, arrangements or systems
- 60/726 . . . the elements or equipments being or involving voltage regulating units
- 60/727 . . . the elements or equipments being or involving measuring units
- 60/728 the measuring units being or involving phasor measuring units [PMU]
- 60/74 . . Systems characterised by state monitoring, e.g. fault, temperature monitoring, insulator monitoring, corona discharge
- 60/76 . . Computer aided design [CAD]; Simulation; Modelling
- 60/78 . . Communication technology specific aspects
- 60/7807 . . . characterised by data transport means between the monitoring, controlling or managing units and monitored, controlled or operated electrical equipment
- 60/7815 using the power network as support for the transmission
- 60/7823 using pulsed signals
- 60/783 using modification of a parameter of the network power signal
- 60/7838 using a wired telecommunication network or a data transmission bus

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- 60/7846 using phone lines
- 60/7853 using wireless data transmission
- 60/7861 By means of mobile telephony
- 60/7869 involving the use of Internet protocol
- 60/7876 . . . Communication technology specific aspects
- 60/7884 using dedicated transmission supports
- 60/7892 using the power network as support for the transmission

70/00 Other energy conversion or management systems reducing GHG emissions

- 70/10 . Hydrogen from electrolysis with energy of non-fossil origin, e.g. PV, wind power, nuclear
- 70/20 . Systems combining fuel cells with production of fuel of non-fossil origin
- 70/30 . Systems combining energy storage with energy generation of non-fossil origin
- 70/40 . Energy efficient batteries, ultracapacitors, supercapacitors or double-layer capacitors charging or discharging systems or methods, e.g. auxiliary power consumption reduction, resonant chargers or dischargers, resistive losses minimisation