

CPC COOPERATIVE PATENT CLASSIFICATION

G PHYSICS (NOTES omitted)

NUCLEONICS

G21 NUCLEAR PHYSICS; NUCLEAR ENGINEERING

G21C NUCLEAR REACTORS (fusion reactors, hybrid fission-fusion reactors [G21B](#); nuclear explosives [G21J](#))

WARNINGS

- The following IPC groups are not in the CPC scheme. The subject matter for these IPC groups is classified in the following CPC groups:
[G21C 19/33](#) covered by [G21C 19/34](#)
- In this subclass non-limiting references (in the sense of paragraph 39 of the Guide to the IPC) may still be displayed in the scheme.

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| 1/00 | Reactor types | 1/18 | coolant being pressurised |
| 1/02 | . Fast fission reactors, i.e. reactors not using a moderator {; Metal cooled reactors; Fast breeders} | 1/20 | moderator being liquid, e.g. pressure-tube reactor |
| 1/022 | . . {characterised by the design or properties of the core} | 1/22 | . . . using liquid or gaseous fuel |
| 1/024 | . . . {where the core is divided in zones with fuel and zones with breeding material} | 1/24 | . . Homogeneous reactors, i.e. in which the fuel and moderator present an effectively homogeneous medium to the neutrons |
| 1/026 | . . . {Reactors not needing refueling, i.e. reactors of the type breed-and-burn, e.g. travelling or deflagration wave reactors or seed-blanket reactors} | 1/26 | . . . Single-region reactors |
| 1/028 | . . {cooled by a pressurised coolant (cooling arrangements G21C 15/00)} | 1/28 | . . . Two-region reactors |
| 1/03 | . . cooled by a coolant not essentially pressurised, e.g. pool-type reactors | 1/30 | . Subcritical reactors {; Experimental reactors other than swimming-pool reactors or zero-energy reactors} |
| 1/04 | . Thermal reactors {; Epithermal reactors} | 1/303 | . . {Experimental or irradiation arrangements inside the reactor (irradiation loops G21C 1/306)} |
| 1/06 | . . Heterogeneous reactors, i.e. in which fuel and moderator are separated | 1/306 | . . {Irradiation loops} |
| 1/07 | . . . Pebble-bed reactors; Reactors with granular fuel | 1/32 | . Integral reactors, i.e. reactors wherein parts functionally associated with the reactor but not essential to the reaction, e.g. heat exchangers, are disposed inside the enclosure with the core (G21C 1/02 - G21C 1/30 take precedence) |
| 1/08 | . . . moderator being highly pressurised, e.g. boiling water reactor, integral super-heat reactor, pressurised water reactor (G21C 1/22 takes precedence) | 1/322 | . . {wherein the heat exchanger is disposed above the core} |
| 1/082 | {Reactors where the coolant is overheated} | 1/324 | . . {wherein the heat exchanger is disposed beneath the core} |
| 1/084 | {Boiling water reactors} | 1/326 | . . {wherein the heat exchanger is disposed next to or beside the core} |
| 1/086 | {Pressurised water reactors} | 1/328 | . . {wherein the prime mover is also disposed in the vessel} |
| 1/088 | {Inherently safe boiling water reactors} | | |
| 1/09 | Pressure regulating arrangements, i.e. pressurisers | 3/00 | Reactor fuel elements and their assemblies; Selection of substances for use as reactor fuel elements |
| 1/10 | moderator and coolant being different or separated | 3/02 | . Fuel elements {(manufacture thereof G21C 21/02)} |
| 1/12 | moderator being solid, e.g. Magnox reactor {or gas-graphite reactor} | 3/04 | . . Constructional details |
| 1/14 | . . . moderator being substantially not pressurised, e.g. swimming-pool reactor (G21C 1/22 takes precedence) | 3/041 | . . . {Means for removal of gases from fuel elements} |
| 1/16 | moderator and coolant being different or separated, e.g. sodium-graphite reactor {, sodium-heavy water reactor or organic coolant-heavy water reactor} | 3/042 | . . . {Fuel elements comprising casings with a mass of granular fuel with coolant passages through them} |
| | | 3/044 | . . . {Fuel elements with porous or capillary structure} |
| | | 3/045 | . . . {Pellets} |

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| 3/047 | {Pellet-clad interaction} | 3/33 | . . . Supporting or hanging of elements in the bundle (spacer grids G21C 3/34); Means forming part of the bundle for inserting it into, or removing it from, the core; Means for coupling adjacent bundles |
| 3/048 | {Shape of pellets} | 3/3305 | {Lower nozzle} |
| 3/06 | . . . Casings; Jackets | 3/331 | {Comprising hold-down means, e.g. springs} |
| 3/07 | characterised by their material, e.g. alloys | 3/3315 | {Upper nozzle} |
| 3/08 | provided with external means to promote heat-transfer, e.g. fins, baffles | 3/332 | Supports for spacer grids |
| 3/10 | End closures {; Means for tight mounting therefor} | 3/334 | . . . Assembling {, maintenance or repair of} the bundles {(assembling, maintenance or repair of other reactor components G21C 19/207)} |
| 3/105 | {Flattened end-closures} | 3/335 | . . . Exchanging elements in irradiated bundles |
| 3/12 | Means forming part of the element for locating it within the reactor core {(means not forming part of the element G21C 5/06)} | 3/336 | . . . Spacer elements for fuel rods in the bundle (spacer grids G21C 3/34) |
| 3/14 | Means forming part of the element for inserting it into, or removing it from, the core; Means for coupling adjacent elements {, e.g. to form a stringer} | 3/338 | Helicoidal spacer elements |
| 3/16 | . . . Details of the construction within the casing | 3/34 | . . . Spacer grids |
| 3/17 | Means for storage or immobilisation of gases in fuel elements | 3/3408 | {Compact spacer grids, e.g. made of a plate or a blade} |
| 3/18 | Internal spacers or other non-active material within the casing, e.g. compensating for expansion of fuel rods or for compensating excess reactivity (interlayers G21C 3/20) | 3/3416 | {Spacer grids formed by metallic wires, e.g. springs} |
| 3/20 | with coating on fuel or on inside of casing; with non-active interlayer between casing and active material {with multiple casings or multiple active layers} | 3/3424 | {Fabrication of spacer grids} |
| 3/22 | . . with fissile or breeder material in contact with coolant | 3/3432 | {Grids designed to influence the coolant, i.e. coolant mixing function} |
| 3/24 | . . with fissile or breeder material in fluid form within a non-active casing | 3/344 | formed of assembled tubular elements |
| 3/26 | . . with fissile or breeder material in powder form within a non-active casing | 3/348 | formed of assembled non-intersecting strips |
| 3/28 | . . with fissile or breeder material in solid form within a non-active casing | 3/352 | formed of assembled intersecting strips |
| 3/30 | . Assemblies of a number of fuel elements in the form of a rigid unit | 3/356 | being provided with fuel element supporting members |
| 3/32 | . . Bundles of parallel pin-, rod-, or tube-shaped fuel elements | 3/3563 | {Supporting members formed only by deformations in the strips} |
| 3/3206 | . . . {Means associated with the fuel bundle for filtering the coolant, e.g. nozzles, grids} | 3/3566 | {Supporting members formed only of elements fixed on the strips} |
| 3/3213 | . . . {Means for the storage or removal of fission gases (means for the storage of fission gases in the elements G21C 3/16; means for the removal of fission gases from elements G21C 3/04)} | 3/36 | . . Assemblies of plate-shaped fuel elements or coaxial tubes |
| 3/322 | . . . Means to influence the coolant flow through or around the bundles | 3/38 | . Fuel units consisting of a single fuel element in a supporting sleeve {or in another supporting element} |
| 3/3225 | {by waterrods} | 3/40 | . Structural combination of fuel element with thermoelectric element for direct production of electric energy from fission heat (for temperature measurement G21C 17/10) {or with another arrangement for direct production of electric energy, e.g. a thermionic device (combination with thermoelements for temperature measurements G21C 17/102)} |
| 3/324 | . . . Coats or envelopes for the bundles | 3/42 | . Selection of substances for use as reactor fuel |
| 3/3245 | {made of moderator material} | 3/44 | . . Fluid or fluent reactor fuel |
| 3/326 | . . . comprising fuel elements of different composition; comprising, in addition to the fuel elements, other pin-, rod-, or tube-shaped elements, e.g. control rods, grid support rods, fertile rods, poison rods or dummy rods | 3/46 | . . . Aqueous compositions |
| 3/3262 | {Enrichment distribution in zones} | 3/48 | True or colloidal solutions of the active constituent |
| 3/3265 | {Radial distribution} | 3/50 | Suspensions of the active constituent; Slurries |
| 3/3267 | {Axial distribution} | 3/52 | . . . Liquid metal compositions |
| 3/328 | Relative disposition of the elements in the bundle lattice | 3/54 | . . . Fused salt, oxide or hydroxide compositions |
| | | 3/56 | . . . Gaseous compositions; Suspensions in a gaseous carrier |
| | | 3/58 | . . Solid reactor fuel {Pellets made of fissile material} |
| | | 3/60 | . . . Metallic fuel; Intermetallic dispersions |
| | | 3/62 | . . . Ceramic fuel |
| | | 3/623 | {Oxide fuels} |
| | | 3/626 | {Coated fuel particles} |

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| 3/64 | Ceramic dispersion fuel, e.g. cermet | 7/22 | . . by displacement of a fluid or fluent neutron-absorbing material {, e.g. by adding neutron-absorbing material to the coolant} |
| 5/00 | Moderator or core structure; Selection of materials for use as moderator | 7/24 | . . Selection of substances for use as neutron-absorbing material |
| 5/02 | . Details | 7/26 | . by displacement of the moderator or parts thereof {by changing the moderator concentration} |
| 5/04 | . . Spatial arrangements allowing for Wigner growth | 7/27 | . . Spectral shift control |
| 5/06 | . . Means for locating or supporting fuel elements { (means forming part of the element G21C 3/12) } | 7/28 | . by displacement of the reflector or parts thereof |
| 5/08 | . . Means for preventing undesired asymmetric expansion of the complete structure {; Stretching devices, pins} | 7/30 | . by displacement of the reactor fuel or fuel elements |
| 5/10 | . . Means for supporting the complete structure { (arrangements for supporting vessels and core-structures G21C 13/024) } | 7/32 | . by varying flow of coolant through the core {by adjusting the coolant or moderator temperature} |
| 5/12 | . characterised by composition, e.g. the moderator containing additional substances which ensure improved heat resistance of the moderator { (purification of fluid moderators during the operation of the reactor G21C 19/30) } | 7/34 | . by utilisation of a primary neutron source |
| 5/123 | . . {Moderators made of organic materials} | 7/36 | . Control circuits |
| 5/126 | . . {Carbonic moderators (carbon and graphite in general C01B 32/00; refractory carbon-bulbs C04B 35/00; carbon electrodes C25B) } | 9/00 | Emergency protection arrangements structurally associated with the reactor {, e.g. safety valves provided with pressure equalisation devices} (emergency cooling arrangements G21C 15/18) |
| 5/14 | . characterised by shape | 9/001 | . {against explosions, e.g. blast shields} |
| 5/16 | . . Shape of its constituent parts | 9/002 | . {against Na- or Ka- reactions} |
| 5/18 | . characterised by the provision of more than one active zone | 9/004 | . Pressure suppression |
| 5/20 | . . wherein one zone contains fissile material and another zone contains breeder material | 9/008 | . . by rupture-discs or -diaphragms |
| 5/22 | . . wherein one zone is a superheating zone | 9/012 | . . by thermal accumulation or by steam condensation, e.g. ice condensers |
| 7/00 | Control of nuclear reaction | 9/016 | . Core catchers |
| 7/005 | . {Flux flattening} | 9/02 | . Means for effecting very rapid reduction of the reactivity factor under fault conditions, e.g. reactor fuse; {Control elements having arrangements activated in an emergency} (control elements per se G21C 7/00) |
| 7/02 | . by using self-regulating properties of reactor materials, {e.g. Doppler effect} (arrangements that involve temperature stability G21C 7/32) | 9/022 | . . {Reactor fuses} |
| 7/04 | . . of burnable poisons (burnable poisons in fuel rods G21C 3/326) | 9/024 | . . {Rupture diaphragms} |
| 7/06 | . by application of neutron-absorbing material, i.e. material with absorption cross-section very much in excess of reflection cross-section | 9/027 | . . by fast movement of a solid, e.g. pebbles |
| 7/08 | . . by displacement of solid control elements, e.g. control rods | 9/033 | . . by an absorbent fluid |
| 7/10 | . . . Construction of control elements | 9/04 | . Means for suppressing fires {Earthquake protection} |
| 7/103 | Control assemblies containing one or more absorbants as well as other elements, e.g. fuel or moderator elements | 9/06 | . . Means for preventing accumulation of explosives gases, e.g. recombiners |
| 7/107 | Control elements adapted for pebble-bed reactors | 11/00 | Shielding structurally associated with the reactor |
| 7/11 | Deformable control elements, e.g. flexible, telescopic, articulated | 11/02 | . Biological shielding (in general G21F) {; Neutron or gamma shielding} |
| 7/113 | Control elements made of flat elements; Control elements having cruciform cross-section | 11/022 | . . {inside the reactor vessel} |
| 7/117 | Clusters of control rods; Spider construction | 11/024 | . . . {structurally combined with the casing} |
| 7/12 | . . . Means for moving control elements to desired position (dropping rods in an emergency G21C 9/02) | 11/026 | . . {in apertures or channels through a wall} |
| 7/14 | Mechanical drive arrangements | 11/028 | . . {characterised by the form or by the material} |
| 7/16 | Hydraulic or pneumatic drive | 11/04 | . . on waterborne craft |
| 7/18 | . . . Means for obtaining differential movement of control elements | 11/06 | . Reflecting shields, i.e. for minimising loss of neutrons |
| 7/20 | . . . Disposition of shock-absorbing devices (shock-absorbers in general F16F) {; Braking arrangements} | 11/08 | . Thermal shields; Thermal linings, i.e. for dissipating heat from gamma radiation which would otherwise heat an outer biological shield {Thermal insulation} |
| | | 11/081 | . . {consisting of a non-metallic layer of insulating material} |
| | | 11/083 | . . {consisting of one or more metallic layers} |
| | | 11/085 | . . . {consisting exclusively of several metallic layers} |
| | | 11/086 | . . {consisting of a combination of non-metallic and metallic layers, e.g. metal-sand-metal-concrete} |
| | | 11/088 | . . {consisting of a stagnant or a circulating fluid} |

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| 13/00 | Pressure vessels; Containment vessels; Containment in general (for chemical or physical processes B01J 3/00; pressure vessels in general F16J 12/00) | 15/247 | . . . for liquid metals |
| 13/02 | . Details | 15/25 | . . . using jet pumps |
| 13/022 | . . {Ventilating arrangements} | 15/253 | . . for gases, e.g. blowers |
| 13/024 | . . Supporting constructions for pressure vessels or containment vessels | 15/257 | . . using heat-pipes {(in general F28D , F28F)} |
| 13/028 | . . Seals, e.g. for pressure vessels or containment vessels | 15/26 | . . by convection, e.g. using chimneys, using divergent channels |
| 13/0285 | . . . {for container apertures} | 15/28 | . Selection of specific coolants (if serving as the moderator G21C 5/12 ; compositions per se C09K 5/00 ; {organic coolants G21C 5/123 }); {Additions to the reactor coolants, e.g. against moderator corrosion (purification and regeneration of the reactor coolants G21C 19/30)} |
| 13/032 | . . Joints between tubes and vessel walls, e.g. taking into account thermal stresses | 17/00 | Monitoring; Testing (measuring in general G01); {Maintaining} |
| 13/036 | . . . the tube passing through the vessel wall, i.e. continuing on both sides of the wall | 17/001 | . {Mechanical simulators (electrical or magnetic simulators G06G 7/54)} |
| 13/04 | . . Arrangements for expansion and contraction | 17/002 | . {Detection of leaks (by testing the coolant or the moderator G21C 17/04)} |
| 13/06 | . . Sealing-plugs (for pressure vessels in general F16J 13/00) | 17/003 | . Remote inspection of vessels, e.g. pressure vessels |
| 13/063 | . . . {Seals for closures or for rotatable closures} | 17/007 | . . Inspection of the outer surfaces of vessels |
| 13/067 | . . . for tubes, e.g. standpipes; Locking devices for plugs | 17/01 | . . Inspection of the inner surfaces of vessels |
| 13/0675 | {Seals for the plugs} | 17/013 | . . Inspection vehicles |
| 13/073 | . . . Closures for reactor-vessels, e.g. rotatable | 17/017 | . Inspection or maintenance of pipe-lines or tubes in nuclear installations |
| 13/0735 | {Seals for closures or for rotatable closures} | 17/02 | . Devices or arrangements for monitoring coolant or moderator |
| 13/08 | . Vessels characterised by the material; Selection of materials for pressure vessels | 17/021 | . . {Solid moderators testing, e.g. graphite} |
| 13/087 | . . Metallic vessels | 17/022 | . . for monitoring liquid coolants or moderators |
| 13/0875 | . . . {Tube-type vessels, e.g. for not essentially pressurised coolants} | 17/0225 | . . . {Chemical surface treatment, e.g. corrosion (corrosion prevention in presence of water from scale removal or by modification of the properties of the liquid C02F 5/00 ; inhibiting corrosion by adding corrosion inhibitors C23F 11/00)} |
| 13/093 | . . Concrete vessels | 17/025 | . . . for monitoring liquid metal coolants {(molten metal sampling in general G01N 1/125)} |
| 13/0933 | . . . {made of prestressed concrete} | 17/0255 | {Liquid metal leaks detection (detecting leaks in pipe-line systems in general F17D 5/00)} |
| 13/0936 | {Particulars concerning prestressing devices and cables} | 17/028 | . . for monitoring gaseous coolants |
| 13/10 | . Means for preventing contamination in the event of leakage, {e.g. double wall} | 17/032 | . . Reactor-coolant flow measuring or monitoring {(measuring volume or mass flow in general G01F)} |
| 15/00 | Cooling arrangements within the pressure vessel containing the core; Selection of specific coolants | 17/035 | . . Moderator- or coolant-level detecting devices {(indicating or measuring liquid level in general G01F 23/00)} |
| 15/02 | . Arrangements or disposition of passages in which heat is transferred to the coolant; {Coolant flow control devices (G21C 19/04 takes precedence; coolant flow control through fuel assemblies, e.g. flow restrictors G21C 3/322)} | 17/038 | . . Boiling detection in moderator or coolant |
| 15/04 | . . from fissile or breeder material {(G21C 3/32 takes precedence)} | 17/04 | . . Detecting burst slugs |
| 15/06 | . . . in fuel elements | 17/041 | . . . {characterised by systems for checking the coolant channels, e.g. matrix systems} |
| 15/08 | . . from moderating material | 17/042 | . . . {Devices for selective sampling, e.g. valves, shutters, rotatable selector valves} |
| 15/10 | . . from reflector or thermal shield | 17/044 | . . . {Detectors and metering devices for the detection of fission products} |
| 15/12 | . . from pressure vessel; from containment vessel | 17/045 | {Precipitation chambers} |
| 15/14 | . . from headers; from joints in ducts | 17/047 | {Detection and metering circuits} |
| 15/16 | . comprising means for separating liquid and steam (separating in general B01D ; steam traps F16D) | 17/048 | . . . {characterised by a special construction of fuel elements, e.g. by a confined "tracer"} |
| 15/18 | . Emergency cooling arrangements; Removing shut-down heat | 17/06 | . Devices or arrangements for monitoring or testing fuel or fuel elements outside the reactor core, e.g. for burn-up, for contamination (G21C 17/08 , G21C 17/10 take precedence; detecting leaking fuel elements during reactor operation G21C 17/04) |
| 15/182 | . . {comprising powered means, e.g. pumps} | | |
| 15/185 | . . . {using energy stored in reactor system} | | |
| 15/187 | . . . {using energy from the electric grid} | | |
| 15/20 | . Partitions or thermal insulation between fuel channel and moderator | | |
| 15/22 | . Structural association of coolant tubes with headers (joints of tubes in general F16L) | | |
| 15/24 | . Promoting flow of the coolant (electrodynamic pumps H02K 44/02) | | |
| 15/243 | . . for liquids | | |

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| 17/063 | . . {Burn-up control (G21C 17/066 takes precedence)} | 19/207 | . . {Assembling, maintenance or repair of reactor components (G21C 3/334 takes precedence)} |
| 17/066 | . . {Control of spherical elements} | 19/22 | . . Arrangements for obtaining access to the interior of a pressure vessel whilst the reactor is operating |
| 17/07 | . . Leak testing | 19/24 | . . . by using an auxiliary vessel which is temporarily sealed to the pressure vessel |
| 17/08 | . Structural combination of reactor core or moderator structure with viewing means, e.g. with television camera, periscope, window | 19/26 | . Arrangements for removing jammed or damaged fuel elements or control elements; Arrangements for moving broken parts thereof |
| 17/10 | . Structural combination of fuel element, control rod, reactor core, or moderator structure with sensitive instruments, e.g. for measuring radioactivity, strain | 19/28 | . Arrangements for introducing fluent material into the reactor core; Arrangements for removing fluent material from the reactor core (pumping coolant G21D) |
| 17/102 | . . {the sensitive element being part of a fuel element or a fuel assembly (structural combination with a thermoelectric element for direct production of electrical energy G21C 3/40)} | 19/30 | . . with continuous purification of circulating fluent material, e.g. by extraction of fission products {deterioration or corrosion products, impurities, e.g. by cold traps (purification of circulating fluid fuels G21C 19/50 ; separation in general B01D)} |
| 17/104 | . . Measuring reactivity | 19/303 | . . . specially adapted for gases (decontamination of gases G21F 9/02) |
| 17/108 | . . Measuring reactor flux | 19/307 | . . . specially adapted for liquids (decontamination of liquids G21F 9/04) |
| 17/112 | . . Measuring temperature | 19/31 | for molten metals |
| 17/116 | . . Passages or insulators, e.g. for electric cables | 19/313 | using cold traps |
| 17/12 | . . Sensitive element forming part of control element | 19/317 | . . . Recombination devices for radiolytic dissociation products |
| 17/14 | . Period meters | 19/32 | . Apparatus for removing radioactive objects or materials from the reactor discharge area, e.g. to a storage place; Apparatus for handling radioactive objects or materials within a storage place or removing them therefrom (disposal of waste material G21F 9/00) |
| 19/00 | Arrangements for treating, for handling, or for facilitating the handling of, fuel or other materials which are used within the reactor, e.g. within its pressure vessel | 19/34 | . Apparatus or processes for dismantling nuclear fuel, e.g. before reprocessing {; Apparatus or processes for dismantling strings of spent fuel elements} (shielded cells G21F 7/00) |
| 19/02 | . Details of handling arrangements | 19/36 | . . Mechanical means only |
| 19/04 | . . Means for controlling flow of coolant over objects being handled; Means for controlling flow of coolant through channel being serviced {, e.g. for preventing "blow-out"} | 19/365 | . . . Removing cannings or casings from fuel |
| 19/06 | . . Magazines for holding fuel elements or control elements | 19/37 | by separating into pieces both the canning or the casing and the fuel element, e.g. by cutting or shearing |
| 19/065 | . . . {Rotatable magazines} | 19/375 | . . . Compacting devices, e.g. for fuel assemblies |
| 19/07 | . . . Storage racks; Storage pools | 19/38 | . . Chemical means only |
| 19/08 | . . Means for heating fuel elements before introduction into the core; Means for heating or cooling fuel elements after removal from the core | 19/40 | . Arrangements for preventing occurrence of critical conditions, e.g. during storage |
| 19/10 | . . Lifting devices or pulling devices adapted for co-operation with fuel elements or with control elements (manipulators B25J) | 19/42 | . Reprocessing of irradiated fuel |
| 19/105 | . . . with grasping or spreading coupling elements | 19/44 | . . of irradiated solid fuel |
| 19/11 | . . . with revolving coupling elements, e.g. socket coupling | 19/46 | . . . Aqueous processes {, e.g. by using organic extraction means, including the regeneration of these means} |
| 19/115 | . . . with latching devices and ball couplings | 19/48 | . . . Non-aqueous processes |
| 19/12 | . . Arrangements for exerting direct hydraulic or pneumatic force on fuel element or on control element | 19/50 | . . of irradiated fluid fuel {, e.g. regeneration of fuels while the reactor is in operation} |
| 19/14 | . characterised by their adaptation for use with horizontal channels in the reactor core | 21/00 | Apparatus or processes specially adapted to the manufacture of reactors or parts thereof (in general section B, e.g. B23) |
| 19/16 | . Articulated or telescopic chutes or tubes for connection to channels in the reactor core | 21/02 | . Manufacture of fuel elements or breeder elements contained in non-active casings |
| 19/18 | . Apparatus for bringing fuel elements to the reactor charge area, e.g. from a storage place | 21/04 | . . by vibrational compaction or tamping {of fuel in the jacket} |
| 19/19 | . Reactor parts specifically adapted to facilitate handling, e.g. to facilitate charging or discharging of fuel elements | 21/06 | . . by {rotatable} swaging {of the jacket around the fuel} |
| 19/20 | . Arrangements for introducing objects into the pressure vessel; Arrangements for handling objects within the pressure vessel; Arrangements for removing objects from the pressure vessel | 21/08 | . . by a slip-fit cladding process {by crimping the jacket around the fuel} |
| 19/202 | . . {Arrangements for handling ball-form, i.e. pebble fuel} | | |
| 19/205 | . . {Interchanging of fuel elements in the core, i.e. fuel shuffling} | | |

G21C

- 21/10 . . by extrusion, drawing, or stretching {by rolling, e.g. "picture frame" technique}
- 21/12 . . by hydrostatic or thermo-pneumatic canning {in general by pressing without lengthening, e.g. explosive coating}
- 21/14 . . by plating {the fuel} in a fluid
- 21/16 . . by casting or dipping techniques
- 21/18 . Manufacture of control elements covered by group [G21C 7/00](#)

23/00 Adaptations of reactors to facilitate experimentation or irradiation