

# 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.

<b>1/00</b>	<b>Reactor types</b>	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 <a href="#">G21C 15/00</a> )}	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 <a href="#">G21C 1/306</a> )}
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 ( <a href="#">G21C 1/02</a> - <a href="#">G21C 1/30</a> take precedence)
1/08	. . . moderator being highly pressurised, e.g. boiling water reactor, integral super-heat reactor, pressurised water reactor ( <a href="#">G21C 1/22</a> 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	<b>3/00</b>	<b>Reactor fuel elements and their assemblies; Selection of substances for use as reactor fuel elements</b>
1/10	. . . . moderator and coolant being different or separated	3/02	. Fuel elements {(manufacture thereof <a href="#">G21C 21/02</a> )}
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 ( <a href="#">G21C 1/22</a> 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}

- 3/047 . . . . {Pellet-clad interaction}
- 3/048 . . . . {Shape of pellets}
- 3/06 . . . Casings; Jackets
- 3/07 . . . . characterised by their material, e.g. alloys
- 3/08 . . . . provided with external means to promote heat-transfer, e.g. fins, baffles
- 3/10 . . . . End closures {; Means for tight mounting therefor}
- 3/105 . . . . . {Flattened end-closures}
- 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)}
- 3/14 . . . . 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}
- 3/16 . . . Details of the construction within the casing
- 3/17 . . . . Means for storage or immobilisation of gases in fuel elements
- 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)
- 3/20 . . . . 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}
- 3/22 . . with fissile or breeder material in contact with coolant
- 3/24 . . with fissile or breeder material in fluid form within a non-active casing
- 3/26 . . with fissile or breeder material in powder form within a non-active casing
- 3/28 . . with fissile or breeder material in solid form within a non-active casing
- 3/30 . Assemblies of a number of fuel elements in the form of a rigid unit
- 3/32 . . Bundles of parallel pin-, rod-, or tube-shaped fuel elements
- 3/3206 . . . {Means associated with the fuel bundle for filtering the coolant, e.g. nozzles, grids}
- 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)}
- 3/322 . . . Means to influence the coolant flow through or around the bundles
- 3/3225 . . . . {by waterrods}
- 3/324 . . . Coats or envelopes for the bundles
- 3/3245 . . . . {made of moderator material}
- 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
- 3/3262 . . . . {Enrichment distribution in zones}
- 3/3265 . . . . . {Radial distribution}
- 3/3267 . . . . . {Axial distribution}
- 3/328 . . . . Relative disposition of the elements in the bundle lattice
- 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
- 3/3305 . . . . . {Lower nozzle}
- 3/331 . . . . . {Comprising hold-down means, e.g. springs}
- 3/3315 . . . . . {Upper nozzle}
- 3/332 . . . . Supports for spacer grids
- 3/334 . . . Assembling {, maintenance or repair of} the bundles {(assembling, maintenance or repair of other reactor components G21C 19/207)}
- 3/335 . . . Exchanging elements in irradiated bundles
- 3/336 . . . Spacer elements for fuel rods in the bundle (spacer grids G21C 3/34)
- 3/338 . . . . Helicoidal spacer elements
- 3/34 . . . Spacer grids
- 3/3408 . . . . {Compact spacer grids, e.g. made of a plate or a blade}
- 3/3416 . . . . {Spacer grids formed by metallic wires, e.g. springs}
- 3/3424 . . . . {Fabrication of spacer grids}
- 3/3432 . . . . {Grids designed to influence the coolant, i.e. coolant mixing function}
- 3/344 . . . . formed of assembled tubular elements
- 3/348 . . . . formed of assembled non-intersecting strips
- 3/352 . . . . formed of assembled intersecting strips
- 3/356 . . . . being provided with fuel element supporting members
- 3/3563 . . . . . {Supporting members formed only by deformations in the strips}
- 3/3566 . . . . . {Supporting members formed only of elements fixed on the strips}
- 3/36 . . Assemblies of plate-shaped fuel elements or coaxial tubes
- 3/38 . Fuel units consisting of a single fuel element in a supporting sleeve {or in another supporting element}
- 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)}
- 3/42 . Selection of substances for use as reactor fuel
- 3/44 . . Fluid or fluent reactor fuel
- 3/46 . . . Aqueous compositions
- 3/48 . . . . True or colloidal solutions of the active constituent
- 3/50 . . . . Suspensions of the active constituent; Slurries
- 3/52 . . . Liquid metal compositions
- 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}

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}
<b>5/00</b>	<b>Moderator or core structure; Selection of materials for use as moderator</b>	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) }	<b>9/00</b>	<b>Emergency protection arrangements structurally associated with the reactor {, e.g. safety valves provided with pressure equalisation devices} (emergency cooling arrangements G21C 15/18)</b>
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
<b>7/00</b>	<b>Control of nuclear reaction</b>	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	<b>11/00</b>	<b>Shielding structurally associated with the reactor</b>
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}

<b>13/00</b>	<b>Pressure vessels; Containment vessels; Containment in general (for chemical or physical processes <a href="#">B01J 3/00</a>; pressure vessels in general <a href="#">F16J 12/00</a>)</b>	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 <a href="#">F28D</a> , <a href="#">F28F</a> )}
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 <a href="#">G21C 5/12</a> ; compositions per se <a href="#">C09K 5/00</a> ; {organic coolants <a href="#">G21C 5/123</a> }); {Additions to the reactor coolants, e.g. against moderator corrosion (purification and regeneration of the reactor coolants <a href="#">G21C 19/30</a> )}
13/032	. . Joints between tubes and vessel walls, e.g. taking into account thermal stresses	<b>17/00</b>	<b>Monitoring; Testing (measuring in general <a href="#">G01</a>); {Maintaining}</b>
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 <a href="#">G06G 7/54</a> )}
13/04	. . Arrangements for expansion and contraction	17/002	. {Detection of leaks (by testing the coolant or the moderator <a href="#">G21C 17/04</a> )}
13/06	. . Sealing-plugs (for pressure vessels in general <a href="#">F16J 13/00</a> )	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 <a href="#">C02F 5/00</a> ; inhibiting corrosion by adding corrosion inhibitors <a href="#">C23F 11/00</a> )}
13/093	. . Concrete vessels	17/025	. . . for monitoring liquid metal coolants {(molten metal sampling in general <a href="#">G01N 1/125</a> )}
13/0933	. . . {made of prestressed concrete}	17/0255	. . . . {Liquid metal leaks detection (detecting leaks in pipe-line systems in general <a href="#">F17D 5/00</a> )}
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 <a href="#">G01F</a> )}
<b>15/00</b>	<b>Cooling arrangements within the pressure vessel containing the core; Selection of specific coolants</b>	17/035	. . Moderator- or coolant-level detecting devices {(indicating or measuring liquid level in general <a href="#">G01F 23/00</a> )}
15/02	. Arrangements or disposition of passages in which heat is transferred to the coolant; {Coolant flow control devices ( <a href="#">G21C 19/04</a> takes precedence; coolant flow control through fuel assemblies, e.g. flow restrictors <a href="#">G21C 3/322</a> )}	17/038	. . Boiling detection in moderator or coolant
15/04	. . from fissile or breeder material {( <a href="#">G21C 3/32</a> 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 <a href="#">B01D</a> ; steam traps <a href="#">F16D</a> )	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 ( <a href="#">G21C 17/08</a> , <a href="#">G21C 17/10</a> take precedence; detecting leaking fuel elements during reactor operation <a href="#">G21C 17/04</a> )
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 <a href="#">F16L</a> )		
15/24	. Promoting flow of the coolant (electrodynamic pumps <a href="#">H02K 44/02</a> )		
15/243	. . for liquids		



17/063	. . {Burn-up control ( <a href="#">G21C 17/066</a> takes precedence)}	19/207	. . {Assembling, maintenance or repair of reactor components ( <a href="#">G21C 3/334</a> 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 ( <a href="#">pumping coolant G21D</a> )
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 <a href="#">G21C 3/40</a> )}	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 ( <a href="#">purification of circulating fluid fuels G21C 19/50</a> ; separation in general <a href="#">B01D</a> )}
17/104	. . Measuring reactivity	19/303	. . . specially adapted for gases ( <a href="#">decontamination of gases G21F 9/02</a> )
17/108	. . Measuring reactor flux	19/307	. . . specially adapted for liquids ( <a href="#">decontamination of liquids G21F 9/04</a> )
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 ( <a href="#">disposal of waste material G21F 9/00</a> )
<b>19/00</b>	<b>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</b>	19/34	. Apparatus or processes for dismantling nuclear fuel, e.g. before reprocessing {; Apparatus or processes for dismantling strings of spent fuel elements} ( <a href="#">shielded cells G21F 7/00</a> )
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 ( <a href="#">manipulators B25J</a> )	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	<b>21/00</b>	<b>Apparatus or processes specially adapted to the manufacture of reactors or parts thereof (in general section B, e.g. <a href="#">B23</a>)</b>
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**