

**CPC****COOPERATIVE PATENT CLASSIFICATION****G21C**

**NUCLEAR REACTORS** (analogue computers therefor [G06G 7/54](#); fusion reactors, hybrid fission-fusion reactors [G21B](#); nuclear explosives [G21J](#))

**WARNING**

The following IPC groups are not used in the CPC scheme:

- [G21C 1/01](#) covered by all other groups of [G21C](#)
- [G21C 19/33](#) covered by all other subgroups of [G21C 19/34](#)

**G21C 1/00****Reactors**[G21C 1/02](#)

- Fast fission reactors, i.e. reactors not using a moderator; {Metal cooled reactors; Fast breeders}

[G21C 1/022](#)

- . {Characterised by the concept and properties of the core}

[G21C 1/024](#)

- . . {where the core is divided in zones with fuel and zones with breeding material}

[G21C 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}

[G21C 1/028](#)

- . . {cooled by a pressurised coolant (cooling arrangements [G21C 15/00](#))}

[G21C 1/03](#)

- . . cooled by a coolant not essentially pressurised, e.g. pool-type reactors

[G21C 1/04](#)

- Thermal reactors; {Epithermal reactors}

[G21C 1/06](#)

- . . Heterogeneous reactors, i.e. in which fuel and moderator are separated

[G21C 1/07](#)

- . . . Pebble-bed reactors; Reactors with granular fuel

[G21C 1/08](#)

- . . . moderator being highly pressurised, e.g. boiling water reactor, integral super-heat reactor, pressurised water reactor ([G21C 1/22](#) takes precedence)

[G21C 1/082](#)

- . . . . {Reactors where the coolant is overheated}

[G21C 1/084](#)

- . . . . {Boiling water reactors}

[G21C 1/086](#)

- . . . . {Pressurised water reactors}

[G21C 2001/088](#)

- . . . . {Inherently safe boiling water reactors}

[G21C 1/09](#)

- . . . . Pressure regulating arrangements, i.e. pressurisers

[G21C 1/10](#)

- . . . . moderator and coolant being different or separated

[G21C 1/12](#)

- . . . . . moderator being solid, e.g. Magnox reactor {gas-graphite reactor}

[G21C 1/14](#)

- . . . . moderator being substantially not pressurised, e.g. swimming-pool reactor ([G21C 1/22](#) takes precedence)

[G21C 1/16](#)

- . . . . . moderator and coolant being different or separated, e.g. sodium-graphite reactor {sodium-heavy water reactor, organic coolant-heavy water reactor}

[G21C 1/18](#)

- . . . . . coolant being pressurised

[G21C 1/20](#)

- . . . . . . moderator being liquid, e.g. pressure-tube reactor {also the construction of the pressure-tubes}

[G21C 1/22](#)

- . . . using liquid or gaseous fuel

- G21C 1/24
  - . . Homogeneous reactors, i.e. in which the fuel and moderator present an effectively homogeneous medium to the neutrons
- G21C 1/26
  - . . . Single-region reactors
- G21C 1/28
  - . . . Two-region reactors
- G21C 1/30
  - . Subcritical reactors; {Experimental reactors with exception of swimming-pool reactors or zero-energy reactors}
- G21C 1/303
  - . . {Experimental and irradiation arrangements inside the reactor (irradiation loops [G21C 1/306](#); material testing by neutrons [G01N 23/005](#))}
- G21C 1/306
  - . . {Irradiation loops}
- G21C 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](#) to [G21C 1/30](#) take precedence)
- G21C 1/322
  - . . {wherein the heat exchanger is disposed above the core}
- G21C 1/324
  - . . {wherein the heat exchanger is disposed beneath the core}
- G21C 1/326
  - . . {wherein the heat exchanger is disposed next to or beside the core}
- G21C 1/328
  - . . {wherein the prime mover is also disposed in the vessel}
- G21C 3/00**
  - Reactor fuel elements and their assemblies; Selection of substances for use as reactor fuel elements**
- G21C 3/02
  - . Fuel elements {(manufacture thereof [G21C 21/02](#))}
- G21C 3/04
  - . . Constructional details
- G21C 3/041
  - . . . {Means for removal of gases from fuel elements}
- G21C 3/042
  - . . . {Fuel elements comprising casings with a mass of granular fuel with coolant passages through them}
- G21C 3/044
  - . . . {Fuel elements with porous or capillary structure}
- G21C 2003/045
  - . . . {Pellets}
- G21C 2003/047
  - . . . . {Pellet-clad interaction}
- G21C 2003/048
  - . . . . {Shape of pellets}
- G21C 3/06
  - . . . Casings; Jackets
- G21C 3/07
  - . . . . characterised by their material, e.g. alloys
- G21C 3/08
  - . . . . provided with external means to promote heat-transfer, e.g. fins, baffles
- G21C 3/10
  - . . . . End closures; {Means for tight mounting therefor}
- G21C 3/105
  - . . . . . {Flattened end-closures}
- G21C 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](#))}
- G21C 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}
- G21C 3/16
  - . . . Details of the construction within the casing
- G21C 3/17
  - . . . . Means for storage or immobilisation of gases in fuel elements
- G21C 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](#))

G21C 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}
G21C 3/22	. . with fissile or breeder material in contact with coolant
G21C 3/24	. . with fissile or breeder material in fluid form within a non-active casing
G21C 3/26	. . with fissile or breeder material in powder form within a non-active casing
G21C 3/28	. . with fissile or breeder material in solid form within a non-active casing
G21C 3/30	. Assemblies of a number of fuel elements in the form of a rigid unit
G21C 3/32	. . Bundles of parallel pin-, rod-, or tube-shaped fuel elements
G21C 3/3206	. . . {Means associated with the fuel bundle for filtering the coolant, e.g. nozzles, grids}
G21C 3/3213	. . . {Means for the storage or removal of fission gases (means for the storage of fission gases in the elements <a href="#">G21C 3/16</a> ; means for the removal of fission gases from elements <a href="#">G21C 3/04</a> )}
G21C 3/322	. . . Means to influence the coolant flow through or around the bundles
G21C 2003/3225	. . . . {by waterrods}
G21C 3/324	. . . Coats or envelopes for the bundles
G21C 3/3245	. . . . {made of moderator material}
G21C 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
G21C 2003/3262	. . . . {Enrichment distribution in zones}
G21C 2003/3265	. . . . . {Radial distribution}
G21C 2003/3267	. . . . . {Axial distribution}
G21C 3/328	. . . . Relative disposition of the elements in the bundle lattice
G21C 3/33	. . . Supporting or hanging of elements in the bundle ( <a href="#">spacer grids G21C 3/34</a> ); Means forming part of the bundle for inserting it into, or removing it from, the core; Means for coupling adjacent bundles
G21C 3/3305	. . . . {Lower nozzle}
G21C 3/331	. . . . {Comprising hold-down means, e.g. springs}
G21C 3/3315	. . . . {Upper nozzle}
G21C 3/332	. . . . Supports for spacer grids
G21C 3/334	. . . Assembling {, maintenance or repair of} the bundles {(assembling, maintenance or repair of other reactor components <a href="#">G21C 19/207</a> )}
G21C 3/335	. . . Exchanging elements in irradiated bundles
G21C 3/336	. . . Spacer elements for fuel rods in the bundle ( <a href="#">spacer grids G21C 3/34</a> )
G21C 3/338	. . . . Helicoidal spacer elements
G21C 3/34	. . . Spacer grids
G21C 3/3408	. . . . {Compact spacer grids, e.g. made of a plate or a blade}
G21C 3/3416	. . . . {Spacer grids formed by metallic wires, e.g. springs}
G21C 3/3424	. . . . {Fabrication of spacer grids}
G21C 2003/3432	. . . . {Grids designed to influence the coolant, i.e. coolant mixing function}
G21C 3/344	. . . . formed of assembled tubular elements

- G21C 3/348 . . . . formed of assembled non-intersecting strips
- G21C 3/352 . . . . formed of assembled intersecting strips
- G21C 3/356 . . . . being provided with fuel element supporting members
- G21C 3/3563 . . . . . {Supporting members formed only by deformations in the strips}
- G21C 3/3566 . . . . . {Supporting members formed only of elements fixed on the strips}
- G21C 3/36 . . Assemblies of plate-shaped fuel elements or coaxial tubes
- G21C 3/38 . Fuel units consisting of a single fuel element in a supporting sleeve {or in another supporting element}
- G21C 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](#))}
- G21C 3/42 . Selection of substances for use as reactor fuel
- G21C 3/44 . . Fluid or fluent reactor fuel
- G21C 3/46 . . . Aqueous compositions
- G21C 3/48 . . . . True or colloidal solutions of the active constituent
- G21C 3/50 . . . . Suspensions of the active constituent; Slurries
- G21C 3/52 . . . Liquid metal compositions
- G21C 3/54 . . . Fused salt, oxide or hydroxide compositions
- G21C 3/56 . . . Gaseous compositions; Suspensions in a gaseous carrier
- G21C 3/58 . . Solid reactor fuel {Pellets made of fissile material}
- G21C 3/60 . . . Metallic fuel; Intermetallic dispersions
- G21C 3/62 . . . Ceramic fuel
- G21C 3/623 . . . . {Oxide fuels}
- G21C 3/626 . . . . {Coated fuel particles}
- G21C 3/64 . . . . Ceramic dispersion fuel, e.g. cermet
- G21C 5/00 Moderator or core structure; Selection of materials for use as moderator**
- G21C 5/02 . Details
- G21C 5/04 . . Spatial arrangements allowing for Wigner growth
- G21C 5/06 . . Means for locating or supporting fuel elements {(means forming part of the element [G21C 3/12](#))}
- G21C 5/08 . . Means for preventing undesired asymmetric expansion of the complete structure; {Stretching devices, pins}
- G21C 5/10 . . Means for supporting the complete structure {(arrangements for supporting vessels and core-structures [G21C 13/024](#))}
- G21C 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](#))}
- G21C 5/123 . . {Moderators made of organic materials}
- G21C 5/126 . . {Carbonic moderators (carbon and graphite in general [C01B 31/00](#); refractory carbon-bulbs [C04B 35/00](#); carbon electrodes [C25B](#))}

- G21C 5/14 . characterised by shape
- G21C 5/16 . . Shape of its constituent parts
- G21C 5/18 . characterised by the provision of more than one active zone
- G21C 5/20 . . wherein one zone contains fissile material and another zone contains breeder material
- G21C 5/22 . . wherein one zone is a superheating zone
  
- G21C 7/00 Control of nuclear reaction**
- G21C 7/005 . {Flux flattening}
- G21C 7/02 . by using self-regulating properties of reactor materials, {e.g. Doppler effect} (arrangements that involve temperature stability [G21C 7/32](#))
- G21C 7/04 . . of burnable poisons (burnable poisons in fuel rods [G21C 3/326](#))
- G21C 7/06 . by application of neutron-absorbing material, i.e. material with absorption cross-section very much in excess of reflection cross-section
- G21C 7/08 . . by displacement of solid control elements, e.g. control rods
- G21C 7/10 . . . Construction of control elements
- G21C 7/103 . . . . Control assemblies containing one or more absorbants as well as other elements, e.g. fuel or moderator elements
- G21C 7/107 . . . . Control elements adapted for pebble-bed reactors
- G21C 7/11 . . . . Deformable control elements, e.g. flexible, telescopic, articulated
- G21C 7/113 . . . . Control elements made of flat elements; Control elements having cruciform cross-section
- G21C 7/117 . . . . Clusters of control rods; Spider construction
- G21C 7/12 . . . Means for moving control elements to desired position (dropping rods in an emergency [G21C 9/02](#))
- G21C 7/14 . . . . Mechanical drive arrangements
- G21C 7/16 . . . . Hydraulic or pneumatic drive
- G21C 7/18 . . . Means for obtaining differential movement of control elements
- G21C 7/20 . . . Disposition of shock-absorbing devices (shock-absorbers in general [F16F](#)) {Braking arrangements}
- G21C 7/22 . . by displacement of a fluid or fluent neutron-absorbing material, {e.g. by adding neutron-absorbing material to the coolant}
- G21C 7/24 . . Selection of substances for use as neutron-absorbing material
- G21C 7/26 . by displacement of the moderator or parts thereof {by changing the moderator concentration}
- G21C 7/27 . . Spectral shift control
- G21C 7/28 . by displacement of the reflector or parts thereof
- G21C 7/30 . by displacement of the reactor fuel or fuel elements
- G21C 7/32 . by varying flow of coolant through the core {by adjusting the coolant or moderator temperature}
- G21C 7/34 . by utilisation of a primary neutron source
- G21C 7/36 . Control circuits

**G21C 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](#))

- G21C 9/001 . {against explosions e.g. blast shields}
- G21C 9/002 . {against Na- or Ka- reactions}
- G21C 9/004 . Pressure suppression
- G21C 9/008 . . by rupture-discs or -diaphragms
- G21C 9/012 . . by thermal accumulation or by steam condensation, e.g. ice condensers
- G21C 9/016 . Core catchers
- G21C 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](#))
- G21C 9/022 . . {Reactor fuses}
- G21C 9/024 . . {Rupture diaphragms}
- G21C 9/027 . . by fast movement of a solid, e.g. pebbles
- G21C 9/033 . . by an absorbent fluid
- G21C 9/04 . Means for suppressing fires {Earthquake protection}
- G21C 9/06 . . Means for preventing accumulation of explosives gases, e.g. recombiners

**G21C 11/00**

**Shielding structurally associated with the reactor**

- G21C 11/02 . Biological shielding (in general [G21F](#) ) {Neutron or gamma shielding}
- G21C 11/022 . . {inside the reactor vessel}
- G21C 11/024 . . . {structurally combined with the casing}
- G21C 11/026 . . {in apertures or channels through a wall}
- G21C 11/028 . . {characterised by the form or by the material}
- G21C 11/04 . . on waterborne craft
- G21C 11/06 . Reflecting shields, i.e. for minimising loss of neutrons
- G21C 11/08 . Thermal shields; Thermal linings, i.e. for dissipating heat from gamma radiation which would otherwise heat an outer biological shield {Thermal insulation}
- G21C 11/081 . . {consisting of a non-metallic layer of insulating material}
- G21C 11/083 . . {consisting of one or more metallic layers}
- G21C 11/085 . . . {consisting exclusively of several metallic layers}
- G21C 11/086 . . {consisting of a combination of non-metallic and metallic layers, e.g. metal-sand-metal-concrete}
- G21C 11/088 . . {consisting of a stagnant or a circulating fluid}

**G21C 13/00**

**Pressure vessels; Containment vessels; Containment in general** (for chemical or physical processes [B01J 3/00](#); pressure vessels in general [F16J 12/00](#))

- G21C 13/02 . Details
- G21C 13/022 . . {Ventilating arrangements}
- G21C 13/024 . . Supporting constructions for pressure vessels or containment vessels
- G21C 13/028 . . Seals, e.g. for pressure vessels or containment vessels

- G21C 13/0285 . . . {for container apertures}
- G21C 13/032 . . Joints between tubes and vessel walls, e.g. taking into account thermal stresses
- G21C 13/036 . . . the tube passing through the vessel wall, i.e. continuing on both sides of the wall
- G21C 13/04 . . Arrangements for expansion and contraction
- G21C 13/06 . . Sealing-plugs (for pressure vessels in general [F16J 13/00](#))
- G21C 2013/063 . . . {Seals for closures or for rotatable closures}
- G21C 13/067 . . . for tubes, e.g. standpipes; Locking devices for plugs
- G21C 13/0675 . . . . {Seals for the plugs}
- G21C 13/073 . . . Closures for reactor-vessels, e.g. rotatable
- G21C 13/0735 . . . . {Seals for closures or for rotatable closures}
- G21C 13/08 . Vessels characterised by the material; Selection of materials for pressure vessels
- G21C 13/087 . . Metallic vessels
- G21C 13/0875 . . . {Tube-type vessels, e.g. for not essentially pressurised coolants}
- G21C 13/093 . . Concrete vessels
- G21C 13/0933 . . . {made of prestressed concrete}
- G21C 13/0936 . . . . {Particulars concerning prestressing devices and cables}
- G21C 13/10 . Means for preventing contamination in the event of leakage, {e.g. double wall}
  
- G21C 15/00** **Cooling arrangements within the pressure vessel containing the core; Selection of specific coolants**
- G21C 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](#))}
- G21C 15/04 . . from fissile or breeder material {([G21C 3/32](#) takes precedence)}
- G21C 15/06 . . . in fuel elements
- G21C 15/08 . . from moderating material
- G21C 15/10 . . from reflector or thermal shield
- G21C 15/12 . . from pressure vessel; from containment vessel
- G21C 15/14 . . from headers; from joints in ducts
- G21C 15/16 . comprising means for separating liquid and steam (separating in general [B01D](#); steam traps [F16D](#))
- G21C 15/18 . Emergency cooling arrangements; Removing shut-down heat
- G21C 15/182 . . {comprising powered means, e.g. pumps}
- G21C 2015/185 . . . {using energy stored in reactor system}
- G21C 2015/187 . . . {using energy from the electric grid}
- G21C 15/20 . Partitions or thermal insulation between fuel channel and moderator
- G21C 15/22 . Structural association of coolant tubes with headers (joints of tubes in general [F16L](#))
- G21C 15/24 . Promoting flow of the coolant (electrodynamic pumps [H02K 44/02](#))
- G21C 15/243 . . for liquids



G21C 15/247	<ul style="list-style-type: none"> <li>for liquid metals</li> </ul>
G21C 15/25	<ul style="list-style-type: none"> <li>using jet pumps</li> </ul>
G21C 15/253	<ul style="list-style-type: none"> <li>for gases, e.g. blowers</li> </ul>
G21C 15/257	<ul style="list-style-type: none"> <li>using heat-pipes {(in general <a href="#">F28D</a>, <a href="#">F28F</a>)}</li> </ul>
G21C 15/26	<ul style="list-style-type: none"> <li>by convection, e.g. using chimneys, using divergent channels</li> </ul>
G21C 15/28	<ul style="list-style-type: none"> <li>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>)}</li> </ul>
<b>G21C 17/00</b>	<b>Monitoring; Testing</b> (measuring in general <a href="#">G01</a> ); {Maintaining}
G21C 17/001	<ul style="list-style-type: none"> <li>{Mechanical simulators (electrical or magnetic simulators <a href="#">G06G 7/54</a>)}</li> </ul>
G21C 17/002	<ul style="list-style-type: none"> <li>{Detection of leaks (by testing the coolant or the moderator <a href="#">G21C 17/04</a>)}</li> </ul>
G21C 17/003	<ul style="list-style-type: none"> <li>Remote inspection of vessels, e.g. pressure vessels</li> </ul>
G21C 17/007	<ul style="list-style-type: none"> <li>Inspection of the outer surfaces of vessels</li> </ul>
G21C 17/01	<ul style="list-style-type: none"> <li>Inspection of the inner surfaces of vessels</li> </ul>
G21C 17/013	<ul style="list-style-type: none"> <li>Inspection vehicles</li> </ul>
G21C 17/017	<ul style="list-style-type: none"> <li>Inspection or maintenance of pipe-lines or tubes in nuclear installations</li> </ul>
G21C 17/02	<ul style="list-style-type: none"> <li>Devices or arrangements for monitoring coolant or moderator</li> </ul>
G21C 17/021	<ul style="list-style-type: none"> <li>{Solid moderators testing, e.g. graphite}</li> </ul>
G21C 17/022	<ul style="list-style-type: none"> <li>for monitoring liquid coolants or moderators</li> </ul>
G21C 17/0225	<ul style="list-style-type: none"> <li>{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>)}</li> </ul>
G21C 17/025	<ul style="list-style-type: none"> <li>for monitoring liquid metal coolants {(molten metal sampling in general <a href="#">G01N 1/125</a>)}</li> </ul>
G21C 17/0255	<ul style="list-style-type: none"> <li>{Liquid metal leaks detection (detecting leaks in pipe-line systems in general <a href="#">F17D 5/00</a>)}</li> </ul>
G21C 17/028	<ul style="list-style-type: none"> <li>for monitoring gaseous coolants</li> </ul>
G21C 17/032	<ul style="list-style-type: none"> <li>Reactor-coolant flow measuring or monitoring {(measuring volume or mass flow in general <a href="#">G01F</a>)}</li> </ul>
G21C 17/035	<ul style="list-style-type: none"> <li>Moderator- or coolant-level detecting devices {(indicating or measuring liquid level in general <a href="#">G01F 23/00</a>)}</li> </ul>
G21C 17/038	<ul style="list-style-type: none"> <li>Boiling detection in moderator or coolant</li> </ul>
G21C 17/04	<ul style="list-style-type: none"> <li>Detecting burst slugs</li> </ul>
G21C 17/041	<ul style="list-style-type: none"> <li>{characterised by systems for checking the coolant channels, e.g. matrix systems}</li> </ul>
G21C 17/042	<ul style="list-style-type: none"> <li>{Devices for selective sampling, e.g. valves, shutters, rotatable selector valves}</li> </ul>
G21C 17/044	<ul style="list-style-type: none"> <li>{Detectors and metering devices for the detection of fission products}</li> </ul>
G21C 17/045	<ul style="list-style-type: none"> <li>{Precipitation chambers}</li> </ul>
G21C 17/047	<ul style="list-style-type: none"> <li>{Detection and metering circuits}</li> </ul>



- G21C 17/048 . . . {characterised by a special construction of fuel elements, e.g. by a confined "tracer"}
- G21C 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](#))
- G21C 17/063 . . {Burn-up control ([G21C 17/066](#) takes precedence)}
- G21C 17/066 . . {Control of spherical elements}
- G21C 17/07 . . Leak testing
- G21C 17/08 . Structural combination of reactor core or moderator structure with viewing means, e.g. with television camera, periscope, window
- G21C 17/10 . Structural combination of fuel element, control rod, reactor core, or moderator structure with sensitive instruments, e.g. for measuring radioactivity, strain
- G21C 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](#))}
- G21C 17/104 . . Measuring reactivity
- G21C 17/108 . . Measuring reactor flux
- G21C 17/112 . . Measuring temperature
- G21C 17/116 . . Passages or insulators, e.g. for electric cables
- G21C 17/12 . . Sensitive element forming part of control element
- G21C 17/14 . Period meters
- G21C 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**
- G21C 19/02 . Details of handling arrangements
- G21C 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"}
- G21C 19/06 . . Magazines for holding fuel elements or control elements
- G21C 19/065 . . . {Rotatable magazines}
- G21C 19/07 . . . Storage racks; Storage pools
- G21C 19/08 . . Means for heating fuel elements before introduction into the core; Means for heating or cooling fuel elements after removal from the core
- G21C 19/10 . . Lifting devices or pulling devices adapted for co-operation with fuel elements or with control elements ([manipulators B25J](#))
- G21C 19/105 . . . with grasping or spreading coupling elements
- G21C 19/11 . . . with revolving coupling elements, e.g. socket coupling
- G21C 19/115 . . . with latching devices and ball couplings
- G21C 19/12 . . Arrangements for exerting direct hydraulic or pneumatic force on fuel element or on control element
- G21C 19/14 . characterised by their adaptation for use with horizontal channels in the reactor core

- G21C 19/16 . Articulated or telescopic chutes or tubes for connection to channels in the reactor core
- G21C 19/18 . Apparatus for bringing fuel elements to the reactor charge area, e.g. from a storage place
- G21C 19/19 . Reactor parts specifically adapted to facilitate handling, e.g. to facilitate charging or discharging of fuel elements
- G21C 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
- G21C 19/202 . . {Arrangements for handling ball-form, i.e. pebble fuel}
- G21C 19/205 . . {Interchanging of fuel elements in the core, i.e. fuel shuffling}
- G21C 19/207 . . {Assembling, maintenance or repair of reactor components ([G21C 3/334](#) takes precedence)}
- G21C 19/22 . . Arrangements for obtaining access to the interior of a pressure vessel whilst the reactor is operating
- G21C 19/24 . . . by using an auxiliary vessel which is temporarily sealed to the pressure vessel
- G21C 19/26 . Arrangements for removing jammed or damaged fuel elements or control elements; Arrangements for moving broken parts thereof
- G21C 19/28 . Arrangements for introducing fluent material into the reactor core; Arrangements for removing fluent material from the reactor core ([pumping coolant G21D](#))
- G21C 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](#))}
- G21C 19/303 . . . specially adapted for gases ([decontamination of gases G21F 9/02](#))
- G21C 19/307 . . . specially adapted for liquids ([decontamination of liquids G21F 9/04](#))
- G21C 19/31 . . . . for molten metals
- G21C 19/313 . . . . using cold traps
- G21C 19/317 . . . Recombination devices for radiolytic dissociation products
- G21C 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](#))
- G21C 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](#))
- G21C 19/36 . . Mechanical means only
- G21C 19/365 . . . Removing cannings or casings from fuel
- G21C 19/37 . . . . by separating into pieces both the canning or the casing and the fuel element, e.g. by cutting or shearing
- G21C 19/375 . . . Compacting devices, e.g. for fuel assemblies
- G21C 19/38 . . Chemical means only
- G21C 19/40 . Arrangements for preventing occurrence of critical conditions, e.g. during storage

G21C 19/42	• Reprocessing of irradiated fuel
G21C 19/44	• • of irradiated solid fuel
G21C 19/46	• • • Aqueous processes, {e.g. by using organic extraction means, including the regeneration of these means}
G21C 19/48	• • • Non-aqueous processes
G21C 19/50	• • of irradiated fluid fuel, {e.g. regeneration of fuels while the reactor is in operation}
<b>G21C 21/00</b>	<b>Apparatus or processes specially adapted to the manufacture of reactors or parts thereof (in general section B, e.g. B23)</b>
G21C 21/02	• Manufacture of fuel elements or breeder elements contained in non-active casings
G21C 21/04	• • by vibrational compaction or tamping {of fuel in the jacket}
G21C 21/06	• • by {rotatable} swaging {of the jacket around the fuel}
G21C 21/08	• • by a slip-fit cladding process {by crimping the jacket around the fuel}
G21C 21/10	• • by extrusion, drawing, or stretching {by rolling, e.g. "picture frame" technique}
G21C 21/12	• • by hydrostatic or thermo-pneumatic canning {in general by pressing without lengthening, e.g. explosive coating}
G21C 21/14	• • by plating {the fuel} in a fluid
G21C 21/16	• • by casting or dipping techniques
G21C 21/18	• Manufacture of control elements covered by group <a href="#">G21C 7/00</a>
<b>G21C 23/00</b>	<b>Adaptations of reactors to facilitate experimentation or irradiation</b>