

**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 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 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 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 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 { ( <a href="#">assembling, maintenance or repair of other reactor components 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 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 ( <a href="#">for temperature measurement G21C 17/10</a> ) { or with another arrangement for direct production of electric energy, e.g. a thermionic device ( <a href="#">combination with thermoelements for temperature measurements G21C 17/102</a> ) }
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 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 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 . . . for liquid metals
- G21C 15/25 . . . using jet pumps
- G21C 15/253 . . . for gases, e.g. blowers
- G21C 15/257 . . . using heat-pipes {( in general [F28D](#), [F28F](#) ) }
- G21C 15/26 . . . by convection, e.g. using chimneys, using divergent channels
  
- G21C 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](#) ) }

<b>G21C 17/00</b>	<b>Monitoring; Testing ( measuring in general <a href="#">G01</a> ); { Maintaining }</b>
<a href="#">G21C 17/001</a>	. { Mechanical simulators ( electrical or magnetic simulators <a href="#">G06G 7/54</a> ) }
<a href="#">G21C 17/002</a>	. { Detection of leaks ( by testing the coolant or the moderator <a href="#">G21C 17/04</a> ) }
<a href="#">G21C 17/003</a>	. Remote inspection of vessels, e.g. pressure vessels
<a href="#">G21C 17/007</a>	. . Inspection of the outer surfaces of vessels
<a href="#">G21C 17/01</a>	. . Inspection of the inner surfaces of vessels
<a href="#">G21C 17/013</a>	. . Inspection vehicles
<a href="#">G21C 17/017</a>	. Inspection or maintenance of pipe-lines or tubes in nuclear installations
<a href="#">G21C 17/02</a>	. Devices or arrangements for monitoring coolant or moderator
<a href="#">G21C 17/021</a>	. . { Solid moderators testing, e.g. graphite }
<a href="#">G21C 17/022</a>	. . for monitoring liquid coolants or moderators
<a href="#">G21C 17/0225</a>	. . . { 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> ) }
<a href="#">G21C 17/025</a>	. . . for monitoring liquid metal coolants { ( molten metal sampling in general <a href="#">G01N 1/125</a> ) }
<a href="#">G21C 17/0255</a>	. . . . { Liquid metal leaks detection ( detecting leaks in pipe-line systems in general <a href="#">F17D 5/00</a> ) }
<a href="#">G21C 17/028</a>	. . for monitoring gaseous coolants
<a href="#">G21C 17/032</a>	. . Reactor-coolant flow measuring or monitoring { ( measuring volume or mass flow in general <a href="#">G01F</a> ) }
<a href="#">G21C 17/035</a>	. . Moderator- or coolant-level detecting devices { ( indicating or measuring liquid level in general <a href="#">G01F 23/00</a> ) }
<a href="#">G21C 17/038</a>	. . Boiling detection in moderator or coolant
<a href="#">G21C 17/04</a>	. . Detecting burst slugs
<a href="#">G21C 17/041</a>	. . . { characterised by systems for checking the coolant channels, e.g. matrix systems }
<a href="#">G21C 17/042</a>	. . . { Devices for selective sampling, e.g. valves, shutters, rotatable selector valves }
<a href="#">G21C 17/044</a>	. . . { Detectors and metering devices for the detection of fission products }
<a href="#">G21C 17/045</a>	. . . . { Precipitation chambers }
<a href="#">G21C 17/047</a>	. . . . { Detection and metering circuits }
<a href="#">G21C 17/048</a>	. . . { characterised by a special construction of fuel elements, e.g. by a confined "tracer" }
<a href="#">G21C 17/06</a>	. 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> )



- 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 }

**G21C 21/00**      **Apparatus or processes specially adapted to the manufacture of reactors or parts thereof ( in general section B, e.g. [B23](#) )**

- 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 [G21C 7/00](#)

**G21C 23/00**      **Adaptations of reactors to facilitate experimentation or irradiation**

**G21C 2001/00**      **Reactors**

- G21C 2001/04      .    Thermal reactors; { Epithermal reactors }
- G21C 2001/06      . .    Heterogeneous reactors, i.e. in which fuel and moderator are separated
- G21C 2001/08      . . .    moderator being highly pressurised, e.g. boiling water reactor, integral super-heat reactor, pressurised water reactor ( [G21C 1/22](#) takes precedence )
- G21C 2001/088      . . . .    Inherently safe boiling water reactors

**G21C 2003/00**      **Reactor fuel elements and their assemblies; Selection of substances for use as reactor fuel elements**

- G21C 2003/02      .    Fuel elements {( manufacture thereof [G21C 21/02](#) )}
- G21C 2003/04      . .    Constructional details
- G21C 2003/045      . . .    Pellets
- G21C 2003/047      . . . .    Pellet-clad interaction
- G21C 2003/048      . . . .    Shape of pellets
- G21C 2003/30      .    Assemblies of a number of fuel elements in the form of a rigid unit
- G21C 2003/32      . .    Bundles of parallel pin-, rod-, or tube-shaped fuel elements
- G21C 2003/322      . . .    Means to influence the coolant flow through or around the bundles
- G21C 2003/3225      . . . .    by waterrods
- G21C 2003/326      . . .    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 2003/34	...	Spacer grids
<a href="#">G21C 2003/3432</a>	....	Grids designed to influence the coolant, i.e. coolant mixing function
<b>G21C 2013/00</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>
G21C 2013/02	.	Details
G21C 2013/06	..	Sealing-plugs ( for pressure vessels in general <a href="#">F16J 13/00</a> )
<a href="#">G21C 2013/063</a>	...	Seals for closures or for rotatable closures
<b>G21C 2015/00</b>		<b>Cooling arrangements within the pressure vessel containing the core; Selection of specific coolants</b>
G21C 2015/18	.	Emergency cooling arrangements; Removing shut-down heat
G21C 2015/182	..	{ comprising powered means, e.g. pumps }
<a href="#">G21C 2015/185</a>	...	using energy stored in reactor system
<a href="#">G21C 2015/187</a>	...	using energy from the electric grid