

**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 ( <a href="#">interlayers G21C 3/20</a> )
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      . . . 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)}

## **G21C 17/00**      **Monitoring; Testing (measuring in general G01); { Maintaining}**

- G21C 17/001      . {Mechanical simulators (electrical or magnetic simulators G06G 7/54)}
- G21C 17/002      . {Detection of leaks (by testing the coolant or the moderator G21C 17/04)}
- G21C 17/003      . Remote inspection of vessels, e.g. pressure vessels



- G21C 17/007      ..      Inspection of the outer surfaces of vessels
- G21C 17/01      ..      Inspection of the inner surfaces of vessels
- G21C 17/013      ..      Inspection vehicles
  
- G21C 17/017      .      Inspection or maintenance of pipe-lines or tubes in nuclear installations
  
- G21C 17/02      .      Devices or arrangements for monitoring coolant or moderator
- G21C 17/021      ..      {Solid moderators testing, e.g. graphite}
- G21C 17/022      ..      for monitoring liquid coolants or moderators
- G21C 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](#))}
- G21C 17/025      ...      for monitoring liquid metal coolants {(molten metal sampling in general [G01N 1/125](#))}
- G21C 17/0255      ....      {Liquid metal leaks detection (detecting leaks in pipe-line systems in general [F17D 5/00](#))}
  
- G21C 17/028      ..      for monitoring gaseous coolants
- G21C 17/032      ..      Reactor-coolant flow measuring or monitoring {(measuring volume or mass flow in general [G01F](#))}
- G21C 17/035      ..      Moderator- or coolant-level detecting devices {(indicating or measuring liquid level in general [G01F 23/00](#))}
- G21C 17/038      ..      Boiling detection in moderator or coolant
- G21C 17/04      ..      Detecting burst slugs
- G21C 17/041      ...      {characterised by systems for checking the coolant channels, e.g. matrix systems}
- G21C 17/042      ...      {Devices for selective sampling, e.g. valves, shutters, rotatable selector valves}
- G21C 17/044      ...      {Detectors and metering devices for the detection of fission products}
- G21C 17/045      ....      {Precipitation chambers}
- G21C 17/047      ....      {Detection and metering circuits}
- 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](#) }
- 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****