

G21B FUSION REACTORS (uncontrolled reactors G21J)

THERMONUCLEAR FUSION REACTORS	1/00
LOW-TEMPERATURE NUCLEAR FUSION REACTORS	3/00

1/00	Thermonuclear fusion reactors [1,8]	1/19	Targets for producing thermonuclear fusion reactions [8]
1/01	Hybrid fission-fusion nuclear reactors [8]	1/21	Electric power supply systems, e.g. for magnet systems [8]
1/03	with inertial plasma confinement [8]	1/23	Optical systems, e.g. for irradiating targets, for heating plasma or for plasma diagnostics [8]
1/05	with magnetic or electric plasma confinement [8]	1/25	Maintenance, e.g. repair or remote inspection [8]
1/11	Details [8]	3/00	Low-temperature nuclear fusion reactors, e.g. alleged cold fusion reactors [8]
1/13	First wall; Blanket; Divertor [8]		
1/15	Particle injectors for producing thermonuclear fusion reactions, e.g. pellet injectors [8]		
1/17	Vacuum chambers; Vacuum systems [8]		

REACTORS	1/00	CONTROL; MONITORING, TESTING	7/00; 17/00
REACTOR ELEMENTS		EMERGENCY PROTECTION	9/00
Fuel; moderator; cooling;		MANUFACTURE	21/00
containment; shielding	3/00; 5/00;	ADAPTATIONS OF REACTORS FOR	
	15/00; 13/00; 11/00	EXPERIMENTATION OR IRRADIATION	23/00
Handling fuel and other materials	19/00		

Reactors	
1/00	General details not provided for in groups G21C 3/00 to G21C 19/00 [3]
1/02	Fast fission reactors, i.e. reactors not using a moderator
1/03	cooled by a coolant not essentially pressurised, e.g. pool-type reactors [5]
1/04	Thermal reactors
1/06	Heterogeneous reactors, i.e. in which fuel and moderator are separated
1/07	Pebble-bed reactors; Reactors with granular fuel [5]
1/08	moderator being highly pressurised, e.g. boiling-water reactor, integral-superheat reactor, pressurised-water reactor (G21C 1/22 takes precedence)
1/09	Pressure regulating arrangements, i.e. pressurisers [5]
1/10	moderator and coolant being different or separated
1/12	moderator being solid, e.g. Magnox reactor
1/14	moderator being substantially not pressurised, e.g. swimming-pool reactor (G21C 1/22 takes precedence)
1/16	moderator and coolant being different or separated, e.g. sodium-graphite reactor
1/18	coolant being pressurised
1/20	moderator being liquid, e.g. pressure-tube reactor
1/22	using liquid or gaseous fuel
1/24	Homogeneous reactors, i.e. in which fuel and moderator present an effectively homogeneous medium to the neutrons
1/26	Single-region reactors
1/28	Two-region reactors
1/30	Subcritical reactors
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) [3]
3/00	Reactor fuel elements or their assemblies; Selection of substances for use as reactor fuel elements
3/02	Fuel elements
3/04	Constructional details
3/06	Casings; Jackets
3/07	characterised by their material, e.g. alloys [5]

- 3/08 provided with external means to promote heat-transfer, e.g. fins, baffles, corrugations
- 3/10 End closures
- 3/12 Means forming part of the element for locating it within the reactor core; External spacers for this purpose
- 3/14 Means forming part of the element for inserting it into, or removing it from, the core; Means for coupling adjacent elements
- 3/16 . . . Details of the construction within the casing
- 3/17 Means for storage or immobilisation of gases in fuel elements [5]
- 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
- 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
- 3/322 . . . Means to influence the coolant flow through or around the bundles [5]
- 3/324 . . . Coats or envelopes for the bundles [5]
- 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 [5]
- 3/328 Relative disposition of the elements in the bundle lattice [5]
- 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 [5]
- 3/332 Supports for spacer grids [5]
- 3/334 Assembling the bundles [5]
- 3/335 Exchanging elements in irradiated bundles [5]
- 3/336 Spacer elements for fuel rods in the bundle (spacer grids G21C 3/34) [5]
- 3/338 Helicoidal spacer elements [5]
- 3/34 Spacer grids
- 3/344 formed of assembled tubular elements [5]
- 3/348 formed of assembled non-intersecting strips [5]
- 3/352 formed of assembled intersecting strips [5]
- 3/356 being provided with fuel element supporting members [5]
- 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
- 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)

- 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
- 3/60 . . . Metallic fuel; Intermetallic dispersions
- 3/62 . . . Ceramic fuel
- 3/64 Ceramic dispersion fuel, e.g. cermet

5/00 Moderator or core structure; Selection of materials for use as moderator

- 5/02 . Details
- 5/04 . . Spatial arrangements allowing for Wigner growth
- 5/06 . . Means for locating or supporting fuel elements
- 5/08 . . Means for preventing undesired asymmetric expansion of the complete structure
- 5/10 . . Means for supporting the complete structure
- 5/12 . characterised by composition, e.g. the moderator containing additional substances which ensure improved heat resistance of the moderator
- 5/14 . characterised by shape
- 5/16 . . Shape of its constituent parts
- 5/18 . characterised by the provision of more than one active zone
- 5/20 . . wherein one zone contains fissile material and another zone contains breeder material
- 5/22 . . wherein one zone is a superheating zone

7/00 Control of nuclear reaction

- 7/02 . by using self-regulating properties of reactor materials (arrangements that involve temperature stability G21C 7/32)
- 7/04 . . of burnable poisons (burnable poisons in fuel rods G21C 3/326) [5]
- 7/06 . by application of neutron-absorbing material, i.e. material with absorption cross-section very much in excess of reflection cross-section
- 7/08 . . by displacement of solid control elements, e.g. control rods
- 7/10 . . . Construction of control elements
- 7/103 Control assemblies containing one or more absorbants as well as other elements, e.g. fuel or moderator elements [5]
- 7/107 Control elements adapted for pebble-bed reactors [5]
- 7/11 Deformable control elements, e.g. flexible, telescopic, articulated [5]
- 7/113 Control elements made of flat elements; Control elements having cruciform cross-section [5]
- 7/117 Clusters of control rods; Spider construction [5]
- 7/12 . . . Means for moving control elements to desired position (dropping rods in an emergency G21C 9/02)
- 7/14 Mechanical drive arrangements
- 7/16 Hydraulic or pneumatic drive arrangements
- 7/18 . . . Means for obtaining differential movement of control elements

7/20	. . . Disposition of shock-absorbing devices (shock-absorbers in general F16F)	15/00	Cooling arrangements within the pressure vessel containing the core; Selection of specific coolants
7/22	. . by displacement of a fluid or fluent neutron-absorbing material	15/02	. Arrangement or disposition of passages in which heat is transferred to the coolant, e.g. for coolant circulation through the supports of the fuel elements
7/24	. . Selection of substances for use as neutron-absorbing material	15/04	. . from fissile or breeder material
7/26	. by displacement of the moderator or parts thereof	15/06	. . . in fuel elements
7/27	. . Spectral shift control [5]	15/08	. . from moderating material
7/28	. by displacement of the reflector or parts thereof	15/10	. . from reflector or thermal shield
7/30	. by displacement of reactor fuel or fuel elements	15/12	. . from pressure vessel; from containment vessel
7/32	. by varying flow of coolant through the core	15/14	. . from ducts conducting a hot fluid; from ducts comprising auxiliary apparatus, e.g. pumps, cameras
7/34	. by utilisation of a primary neutron source	15/16	. comprising means for separating liquid and steam (separating in general B01D; steam traps F16T)
7/36	. Control circuits	15/18	. Emergency cooling arrangements; Removing shut-down heat
9/00	Emergency protection arrangements structurally associated with the reactor (emergency cooling arrangements G21C 15/18)	15/20	. Partitions or thermal insulation between fuel channel and moderator, e.g. in pressure tube reactors
9/004	. Pressure suppression [5]	15/22	. Structural association of coolant tubes with headers or other pipes, e.g. in pressure tube reactors (joints of tubes in general F16L) [4]
9/008	. . by rupture-discs or -diaphragms [5]	15/24	. Promoting flow of the coolant (electrodynamic pumps H02K 44/02)
9/012	. . by thermal accumulation or by steam condensation, e.g. ice condensers [5]	15/243	. . for liquids [5]
9/016	. Core catchers [5]	15/247	. . . for liquid metals [5]
9/02	. Means for effecting very rapid reduction of the reactivity factor under fault conditions, e.g. reactor fuse	15/25	. . . using jet pumps [5]
9/027	. . by fast movement of a solid, e.g. pebbles [5]	15/253	. . for gases, e.g. blowers [5]
9/033	. . by an absorbent fluid [5]	15/257	. . using heat-pipes [5]
9/04	. Means for suppressing fires	15/26	. . by convection, e.g. using chimneys, using divergent channels
9/06	. . Means for preventing accumulation of explosives gases, e.g. recombiners [5]	15/28	. Selection of specific coolants (if serving as the moderator G21C 5/12; heat-transfer or heat-exchange materials C09K 5/00)
11/00	Shielding structurally associated with the reactor	17/00	Monitoring; Testing (measuring in general G01)
11/02	. Biological shielding (in general G21F)	17/003	. Remote inspection of vessels, e.g. pressure vessels [5]
11/04	. . on waterborne craft	17/007	. . Inspection of the outer surfaces of vessels [5]
11/06	. Reflecting shields, i.e. for minimising loss of neutrons	17/01	. . Inspection of the inner surfaces of vessels [5]
11/08	. Thermal shields; Thermal linings, i.e. for dissipating heat from gamma radiation which would otherwise heat an outer biological shield	17/013	. . Inspection vehicles [5]
13/00	Pressure vessels; Containment vessels; Containment in general (for chemical or physical processes B01J 3/00; pressure vessels in general F16J 12/00)	17/017	. Inspection or maintenance of pipe-lines or tubes in nuclear installations [5]
13/02	. Details	17/02	. Devices or arrangements for monitoring coolant or moderator
13/024	. . Supporting constructions for pressure vessels or containment vessels [5]	17/022	. . for monitoring liquid coolants or moderators [5]
13/028	. . Seals, e.g. for pressure vessels or containment vessels [5]	17/025	. . . for monitoring liquid metal coolants [5]
13/032	. . Joints between tubes and vessel walls, e.g. taking into account thermal stresses [5]	17/028	. . for monitoring gaseous coolants [5]
13/036	. . . the tube passing through the vessel wall, i.e. continuing on both sides of the wall [5]	17/032	. . Reactor-coolant flow measuring or monitoring [5]
13/04	. . Arrangements for expansion and contraction	17/035	. . Moderator- or coolant-level detecting devices [5]
13/06	. . Sealing-plugs (for pressure vessels in general F16J 13/00)	17/038	. . Boiling detection in moderator or coolant [5]
13/067	. . . for tubes, e.g. standpipes; Locking devices for plugs [5]	17/04	. . Detecting burst slugs
13/073	. . . Closures for reactor-vessels, e.g. rotatable [5]	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)
13/08	. Vessels characterised by the material; Selection of materials for pressure vessels	17/07	. . Leak testing [5]
13/087	. . Metallic vessels [5]	17/08	. Structural combination of reactor core or moderator structure with viewing means, e.g. with television camera, periscope, window
13/093	. . Concrete vessels [5]	17/10	. Structural combination of fuel element, control rod, reactor core, or moderator structure with sensitive instruments, e.g. for measuring radioactivity, strain
13/10	. Means for preventing contamination in event of leakage	17/104	. . Measuring reactivity [5]
		17/108	. . Measuring reactor flux [5]

17/112	. . . Measuring temperature [5]	19/30	. . . with continuous purification of circulating fluent material, e.g. by extraction of fission products
17/116	. . . Passages or insulators, e.g. for electric cables [5]	19/303	. . . specially adapted for gases (decontamination of gases G21F 9/02) [5]
17/12	. . . Sensitive element forming part of control element	19/307	. . . specially adapted for liquids (decontamination of liquids G21F 9/04) [5]
17/14	. . . Period meters	19/31	. . . . . for molten metals [5]
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 [2]	19/313	. . . . . using cold traps [5]
19/02	. . . Details of handling arrangements	19/317	. . . . . Recombination devices for radiolytic dissociation products [5]
19/04	. . . Means for controlling flow of coolant over objects being handled; Means for controlling flow of coolant through channel being serviced	19/32	. . . Apparatus for removing radioactive objects or materials from the reactor discharge area, e.g. to a storage place; Apparatus for handling radioactive objects or materials within a storage place or removing them therefrom (disposal of waste material G21F 9/00)
19/06	. . . Means for supporting or storing fuel elements or control elements [4]	19/33	. . . Apparatus or processes for dismantling strings of spent fuel elements (G21C 19/34 takes precedence) [2]
19/07	. . . . . Storage racks; Storage pools [5]	19/34	. . . Apparatus or processes for dismantling nuclear fuel, e.g. before reprocessing (shielded cells G21F 7/00) [5]
19/08	. . . Means for heating fuel elements before introduction into the core; Means for heating or cooling fuel elements after removal from the core	19/36	. . . Mechanical means only
19/10	. . . Lifting devices or pulling devices adapted for co-operation with fuel elements or with control elements (manipulators B25J)	19/365	. . . . . Removing cannings or casings from fuel [5]
19/105	. . . . . with grasping or spreading coupling elements [5]	19/37	. . . . . by separating into pieces both the canning or the casing and the fuel element, e.g. by cutting or shearing [5]
19/11	. . . . . with revolving coupling elements, e.g. socket coupling [5]	19/375	. . . . . Compacting devices, e.g. for fuel assemblies [5]
19/115	. . . . . with latching devices and ball couplings [5]	19/38	. . . Chemical means only
19/12	. . . Arrangements for exerting direct hydraulic or pneumatic force on fuel element or on control element	19/40	. . . Arrangements for preventing occurrence of critical conditions, e.g. during storage
19/14	. . . characterised by their adaptation for use with horizontal channels in the reactor core	19/42	. . . Reprocessing of irradiated fuel
19/16	. . . Articulated or telescopic chutes or tubes for connection to channels in the reactor core	19/44	. . . . . of irradiated solid fuel
19/18	. . . Apparatus for bringing fuel elements to the reactor charge area, e.g. from a storage place	19/46	. . . . . Aqueous processes
19/19	. . . Reactor parts specifically adapted to facilitate handling, e.g. to facilitate charging or discharging of fuel elements [3]	19/48	. . . . . Non-aqueous processes
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	19/50	. . . . . of irradiated fluid fuel
19/22	. . . Arrangements for obtaining access to the interior of a pressure vessel whilst the reactor is operating	21/00	Apparatus or processes specially adapted to the manufacture of reactors or parts thereof (in general, section B, e.g. B23)
19/24	. . . . . by using an auxiliary vessel which is temporarily sealed to the pressure vessel	21/02	. . . Manufacture of fuel elements or breeder elements contained in non-active casings
19/26	. . . Arrangements for removing jammed or damaged fuel elements or control elements; Arrangements for moving broken parts thereof	21/04	. . . . . by vibrational compaction or tamping
19/28	. . . Arrangements for introducing fluent material into the reactor core; Arrangements for removing fluent material from the reactor core (pumping coolant G21D)	21/06	. . . . . by swaging
		21/08	. . . . . by a slip-fit cladding process
		21/10	. . . . . by extrusion, drawing, or stretching
		21/12	. . . . . by hydrostatic or thermo-pneumatic canning
		21/14	. . . . . by plating 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 [3]

G21D NUCLEAR POWER PLANT (electric or magnetic analogue computers, e.g. simulators, for nuclear physics G06G 7/54)

1/00	Details of nuclear power plant (control G21D 3/00)	3/00	Control of nuclear power plant (control of nuclear reaction in general G21C 7/00)
1/02	. . . Arrangements of auxiliary equipment	3/02	. . . Manual control
1/04	. . . Pumping arrangements (by means within the reactor pressure vessel G21C 15/24; electrodynamic pumps H02K 44/02)	3/04	. . . Safety arrangements (emergency protection of reactor G21C 9/00)

3/06	. . responsive to faults within the plant (in the reactor G21C 9/00)	5/08	. . with engine working medium heated in a heat exchanger by the reactor coolant
3/08	. Regulation of any parameters in the plant	5/10	. . . Liquid working medium partially heated by reactor and vaporised by heat source external to the core, e.g. with oil heating
3/10	. . by a combination of a variable derived from neutron flux with other controlling variables, e.g. derived from temperature, cooling flow, pressure	5/12	. . . Liquid working medium vaporised by reactor coolant
3/12	. . by adjustment of the reactor in response only to changes in engine demand	5/14	. . . . and also superheated by reactor coolant
3/14	. . . Varying flow of coolant	5/16	. . . . superheated by separate heat source
3/16	. . . Varying reactivity	7/00	Arrangements for direct production of electric energy from fusion or fission reactions (obtaining electric energy from radioactive sources G21H 1/00)
3/18	. . by adjustment of plant external to the reactor only in response to change in reactivity	7/02	. using magneto-hydrodynamic generators
5/00	Arrangements of reactor and engine in which reactor-produced heat is converted into mechanical energy	7/04	. using thermoelectric elements (structural combination of fuel element with thermoelectric element G21C 3/40; thermoelectric elements <u>per se</u> H01L 35/00, H01L 37/00)
5/02	. Reactor and engine structurally combined, e.g. portable	9/00	Arrangements to provide heat for purposes other than conversion into power, e.g. for heating buildings
5/04	. Reactor and engine not structurally combined		
5/06	. . with engine working medium circulating through reactor core		

G21F PROTECTION AGAINST X-RADIATION, GAMMA RADIATION, CORPUSCULAR RADIATION OR PARTICLE BOMBARDMENT; TREATING RADIOACTIVELY CONTAMINATED MATERIAL; DECONTAMINATION ARRANGEMENTS THEREFOR (radiation protection by pharmaceutical means A61K 8/00, A61Q 17/00; in cosmonautic vehicles B64G; combined with a reactor G21C 11/00; combined with X-ray tubes H01J 35/16; combined with X-ray apparatus H05G 1/02)

1/00	Shielding characterised by the composition of the material	5/04	. . Means for controlling exposure, e.g. time, size of aperture (controlling exposure to X-radiation H05G 1/30)
1/02	. Selection of uniform shielding materials	5/06	. Details of, or accessories to, the containers [5]
1/04	. . Concretes; Other hydraulic hardening materials	5/08	. . Shock-absorbers, e.g. impact buffers for containers [5]
1/06	. . Ceramics; Glasses; Refractories (cermets G21F 1/08)	5/10	. . Heat-removal systems, e.g. using circulating fluid or cooling fins [5]
1/08	. . Metals; Alloys; Cermets, i.e. sintered mixtures of ceramics and metals	5/12	. . Closures for containers; Sealing arrangements [5]
1/10	. . Organic substances; Dispersions in organic carriers	5/14	. . Devices for handling containers or shipping-casks, e.g. transporting devices [5]
1/12	. Laminated shielding materials	7/00	Shielded cells or rooms (chambers provided with manipulating devices in general B25J)
3/00	Shielding characterised by its physical form, e.g. granules, or shape of the material	7/005	. Shielded passages through walls; Locks; Transferring devices between rooms (between glove-boxes G21F 7/047) [5]
3/02	. Clothing (protective clothing or garments in general A41D 13/00)	7/01	. . Transferring by fluidic means [5]
3/025	. . Clothing completely surrounding the wearer [5]	7/015	. Room atmosphere, temperature or pressure control devices [5]
3/03	. . Aprons [5]	7/02	. Observation devices permitting vision but shielding the observer
3/035	. . Gloves (mounting means on glove boxes G21F 7/053) [5]	7/03	. . Windows, e.g. shielded [5]
3/04	. Bricks; Shields made up therefrom	7/04	. Shielded glove-boxes (glove-boxes in general B25J 21/02)
5/00	Transportable or portable shielded containers	7/047	. . Shielded passages; Closing or transferring means between glove-boxes [5]
5/002	. Containers for fluid radioactive wastes [5]	7/053	. . Glove mounting means [5]
5/005	. Containers for solid radioactive wastes, e.g. for ultimate disposal [5]	7/06	. Structural combination with remotely-controlled apparatus, e.g. with manipulators (manipulators B25J; remote control in general G05)
5/008	. . Containers for fuel elements [5]	9/00	Treating radioactively contaminated material; Decontamination arrangements therefor [2,5]
5/012	. . . Fuel element racks in the containers [5]	9/02	. Treating gases [2]
5/015	. for storing radioactive sources, e.g. source carriers for irradiation units; Radioisotope containers [5]	9/04	. Treating liquids [2]
5/018	. . Syringe shields or holders (syringe shielding for applying radioactive material to the body A61M 36/08) [5]		
5/02	. with provision for restricted exposure of a radiation source within the container		

G21F – G21H

9/06	. . . Processing (separating different isotopes of the same chemical element B01D 59/00)	9/24	. . . by storage in the ground; by storage under water, e.g. in ocean
9/08	. . . by evaporation; by distillation	9/26	. . . by dilution in water, e.g. in ocean, in stream
9/10	. . . by flocculation	9/28	. Treating solids [2]
9/12	. . . by absorption; by adsorption; by ion-exchange	9/30	. . . Processing (separating different isotopes of the same chemical element B01D 59/00)
9/14	. . . by incineration; by calcination, e.g. desiccation	9/32	. . . by incineration
9/16	. . . by fixation in stable solid media	9/34	. . Disposal of solid waste
9/18	. . . by biological processes	9/36	. . . by packaging; by baling
9/20	. . Disposal of liquid waste		
9/22	. . . by storage in a tank or other container		

G21G **CONVERSION OF CHEMICAL ELEMENTS; RADIOACTIVE SOURCES** (applications of radiation in general G21H 5/00; handling particles, e.g. neutrons, or electromagnetic radiation not otherwise provided for G21K) [2]

1/00	Arrangements for converting chemical elements by electromagnetic radiation, corpuscular radiation, or particle bombardment, e.g. producing radioactive isotopes (separation of different isotopes of the same element B01D 59/00; by thermonuclear reactions in nuclear reactors G21B; conversion of nuclear fuel in nuclear reactors G21C) [2]	4/00	Radioactive sources (producing neutrons or other subatomic particles, X- or gamma rays, in fusion reactors G21B, in nuclear reactors G21C, by cosmic radiation G21H 7/00, in accelerators H05H; X-ray tubes H01J 35/00; gamma masers H01S 4/00) [2]
1/02	. in nuclear reactors	4/02	. Neutron sources [2]
1/04	. outside of nuclear reactors or particle accelerators [2]	4/04	. Radioactive sources other than neutron sources (radioactive dressings A61M 36/14) [2]
1/06	. . by neutron irradiation [2]	4/06	. . characterised by constructional features [2]
1/08	. . . accompanied by nuclear fission [2]	4/08	. . . specially adapted for medical applications (radiation therapy using radioactive sources A61N 5/10) [2]
1/10	. . by bombardment with electrically-charged particles (irradiation devices G21K 5/00) [2]	4/10	. . with radium emanation [2]
1/12	. . by electromagnetic irradiation, e.g. with gamma or X-rays (applications of radiation G21H 5/00; irradiation devices G21K 5/00) [2]	5/00	Alleged conversion of chemical elements by chemical reaction

G21H **OBTAINING ENERGY FROM RADIOACTIVE SOURCES; APPLICATIONS OF RADIATION FROM RADIOACTIVE SOURCES; UTILISING COSMIC RADIATION** (measurement of nuclear or X-radiation G01T; fusion reactors G21B; nuclear reactors G21C; semiconductor devices sensitive to electromagnetic or corpuscular radiation H01L 31/00)

1/00	Arrangements for obtaining electrical energy from radioactive sources, e.g. from radioactive isotopes	3/00	Arrangements for direct conversion of radiation energy from radioactive sources into forms of energy other than electric energy, e.g. light (lasers H01S 3/00)
1/02	. Cells charged directly by beta radiation	3/02	. in which material is excited to luminesce by the radiation (lamps in which a gas filling or screen or coating is excited to luminesce by radioactive material structurally associated with the lamp H01J 65/00)
1/04	. Cells using secondary emission induced by alpha radiation, beta radiation, or gamma radiation (discharge tubes H01J 40/00, H01J 47/00)		
1/06	. Cells wherein radiation is applied to the junction of different semiconductor materials		
1/08	. Cells in which radiation ionises a gas in the presence of a junction of two dissimilar metals, i.e. contact potential-difference cells (discharge tubes H01J)		
1/10	. Cells in which radiation heats a thermoelectric junction or a thermionic converter (discharge tubes functioning as thermionic generators H01J 45/00; thermoelectric devices comprising a junction of dissimilar materials H01L 35/00) [2]		
1/12	. Cells using conversion of the radiation into light combined with subsequent photoelectric conversion into electric energy		

5/00 Applications of radiation from radioactive sources or arrangements therefor (producing mutation in plants A01H 1/06; preservation of dairy products A23C; preservation of foodstuffs A23L 3/26; for therapeutic purposes A61N 5/10; in chemical, physical or physicochemical processes in general B01J 19/08; in electrostatic separation B03C 3/38; for after-treatment of coatings applied as liquids or other fluent materials B05D 3/06; for action between electric vehicles and tracked apparatus B61L 1/10, B61L 3/06; introducing isotopes into organic compounds C07B 59/00; for preparation of organic chemical compounds C07, C08, e.g. C08F 2/46; for treating macromolecular substances or articles made therefrom B29C 71/04, C08J 3/28,

C08J 7/18; for cracking of hydrocarbon oils C10G 15/00, C10G 32/04; for reforming naphtha C10G 35/16; preservation or ageing of products obtained from fermentation processes C12H 1/06, C12H 1/16; for bleaching fibres D06L 3/04; measuring G01; irradiation devices, gamma- or X-ray microscopes G21K; in discharge tubes H01J; apparatus for generating ions to be introduced into non-enclosed gases, e.g. into the atmosphere, H01T 23/00; for carrying-off electrostatic charges H05F 3/06)

- . as tracers

5/02

7/00 Use of effects of cosmic radiation

G21J NUCLEAR EXPLOSIVES; APPLICATIONS THEREOF (electric or magnetic analogue computers, e.g. simulators, for nuclear physics G06G 7/54)

Note

This subclass covers uncontrollable fission or fusion reactions.

1/00 Nuclear explosive devices

3/00 Peaceful applications of nuclear explosive devices

3/02 . for excavation

5/00 Detection arrangements for nuclear explosions (individual measuring devices G01)

G21K TECHNIQUES FOR HANDLING PARTICLES OR ELECTROMAGNETIC RADIATION NOT OTHERWISE PROVIDED FOR; IRRADIATION DEVICES; GAMMA- OR X-RAY MICROSCOPES (X-ray technique H05G; plasma technique H05H) [2]

1/00 Arrangements for handling radiation or particles, e.g. focusing, moderating (radiation filters G21K 3/00) [2]

1/02 . using diaphragms, collimators [2]

1/04 . . using variable diaphragms, shutters, choppers [2]

1/06 . using diffraction, refraction, or reflection, e.g. monochromators (G21K 1/10, G21K 7/00 take precedence) [2]

1/08 . Deviation, concentration, or focusing of the beam by electric or magnetic means (electron-optical arrangements in electric discharge tubes H01J 29/46) [2]

1/087 . . by electrical means [4]

1/093 . . by magnetic means [4]

1/10 . Scattering devices; Absorbing devices [2]

1/12 . . Resonant absorbers or driving arrangements therefor, e.g. for Mössbauer-effect devices [3]

1/14 . using charge exchange devices, e.g. for neutralising or changing the sign of the electrical charges of beams (producing or accelerating neutral particle beams H05H 3/00) [3]

1/16 . using polarising devices, e.g. for obtaining a polarised ion beam [3]

3/00 Radiation filters, e.g. X-ray filters [2]

4/00 Conversion screens for the conversion of the spatial distribution of X-rays or particle radiation into visible images, e.g. fluoroscopic screens (photographic processes using X-ray intensifiers G03C 5/17; discharge tubes comprising luminescent screens H01J 1/62; cathode ray tubes for X-ray conversion with optical output H01J 31/50) [3]

5/00 Irradiation devices (adaptations of reactors to facilitate irradiation G21C 23/00; discharge tubes for irradiating H01J 33/00, H01J 37/00) [2]

5/02 . having no beam-forming means [2]

5/04 . with beam-forming means [2]

5/08 . Holders for targets or for objects to be irradiated [2]

5/10 . with provision for relative movement of beam source and object to be irradiated [3]

7/00 Gamma- or X-ray microscopes [2]