

G21C

NUCLEAR REACTORS (fusion reactors, hybrid fission-fusion reactors [G21B](#); nuclear explosives [G21J](#))

Definition statement

This place covers:

All aspects related to nuclear fission reactors and their components, i.e. all aspects related to the reactors per se, in particular all parts strictly related to the primary cooling circuit of the reactor, as well as monitoring or testing of nuclear fission reactor parameters and components, arrangements for handling nuclear fission reactor components or material and apparatuses and processes adapted to manufacture nuclear fission reactors.

References

Limiting references

This place does not cover:

Nuclear fusion reactors	G21B
Nuclear explosives and their application	G21J

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Arrangements of nuclear propulsion power plant or units on marine vessels, including submarines; adaptations to nuclear propulsion power plant or units for facilitating their arrangement on marine vessels	B63H 21/18
Nuclear spacecraft propulsion	B64G 1/408 , B64G 1/422
Water treatment using waste heat from other processes	C02F 1/16
Methods and apparatus for obtaining oil, gas, water, soluble or meltable materials by means of nuclear energy	E21B 43/2403
Aspects related to nuclear power plants in general, other than the reactor per se	G21D
Control of nuclear power plant	G21D 3/00
Arrangements of reactor and engine in which reactor-produced heat is converted into mechanical energy	G21D 5/00
Arrangements to provide heat for purposes other than conversion into power, e.g. heating buildings	G21D 9/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Pressure or containment vessels utilizing sub- or super-atmospheric pressure to effect chemical or physical change of matter	B01J 3/00
Cleaning pipes or tubes using methods or apparatus specially adapted thereto	B08B 9/02
Manipulators	B25J
Heat-transfer or heat-exchange or heat-storage materials	C09K 5/00

Shock-absorbers in general	F16F
Pressure vessels in general	F16J 12/00
Tube joints in general	F16L
Cleaning of internal or external surfaces of heat-exchange or heat-transfer conduits, e.g. water tubes of boilers	F28G
Measurement of nuclear radiation	G01T
Electric or magnetic analogue computers, e.g. simulators, for nuclear physics	G06G 7/54
Pumping arrangements for reactor coolant not otherwise covered by G21C 15/24	G21D
Shielded cells or rooms	G21F 7/00
Treating radioactively contaminated materials; Decontamination arrangements therefor	G21F 9/00

Special rules of classification

Classification of both important (invention) information and additional information is obligatory.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Core	The central region of a reactor containing fuel and moderator elements, where nuclear fission occurs.
Moderator	Material used in a thermal nuclear reactor to reduce the velocity of neutrons produced by nuclear fission in order to facilitate chain reaction.
Shield	Means surrounding a reactor to prevent radiation damage to operators etc.

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

LWR	Light Water Reactor
BWR	Boiling Water Reactor
ABWR	Advanced Boiling Water Reactor
PWR	Pressurized/Pressure Water Reactor
PHWR	Pressurized Heavy Water Reactor
RBMK	High Power Channel Reactor
GCR	Gas Cooled Reactor
HTGCR	High Temperature Gas Cooled Reactor
FBR	Fast Breeder Reactor
LMFBR	Liquid Metal Fast Breeder Reactor
PBR	Pebble Bed Reactor
IFR	Integral Fast Reactor
RPV	Reactor Pressure Vessel

CRDM	Control Rod Drive Mechanism
PCI	Pellet-Clad Interaction
LOCA	LOss of Coolant Accident

In patent documents, the following words/expressions are often used as synonyms:

- "breed and burn reactor", "travelling wave reactor" and "deflagration wave reactor"

G21C 1/00

Reactor types

Definition statement

This place covers:

Nuclear fission reactors characterized by their type.

Main division is made between fast neutron driven fission and moderated neutron drive fission reactors, the reactors being either critical or subcritical, loop-type or integral.

Dedicated sections are defined for subcritical and integral reactors.

Relationships with other classification places

Classification is usually directed to main groups [G21C 3/00](#) - [G21C 23/00](#).

Classification is also made in this group for subject-matter related to new reactor concepts or for subject-matter in which the type of reactor plays a crucial role.

G21C 1/20

moderator being liquid, e.g. pressure-tube reactor

Definition statement

This place covers:

Reactors in which the moderator is liquid, such as pressure-tube reactors. This group also covers constructional details of pressure tubes in pressure-tube reactors.

G21C 1/303

{Experimental or irradiation arrangements inside the reactor (irradiation loops [G21C 1/306](#))}

References

Limiting references

This place does not cover:

Irradiation loops	G21C 1/306
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Material testing by neutrons	G01N 23/005
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G21C 3/00

Reactor fuel elements and their assemblies; Selection of substances for use as reactor fuel elements

References

Limiting references

This place does not cover:

Core structures characterised by the provision of more than one active zone in which the core does not comprise fuel assemblies	G21C 5/18
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Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Fuel rod, fuel pin, fuel element	Single fuel rod being part of bundle of fuel rods comprised in a fuel assembly
Fuel bundle	Fuel assembly
Fuel element	In some patent documents, in particular in those with German origin, this expression is sometimes used as meaning "fuel assembly"

G21C 3/42

Selection of substances for use as reactor fuel

Definition statement

This place covers:

This group covers all substances which are used as nuclear reactor fuel, either liquid or fluent nuclear fuel, gaseous compositions or solid nuclear reactor fuel.

References

Limiting references

This place does not cover:

Nuclear fuel elements	G21C 3/02
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Obtaining metals with atomic number greater than 87	C22B 60/00
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Synonyms and Keywords

In patent documents, the following abbreviations are often used:

MOX	Mixed Oxide Fuel
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G21C 5/00

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

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Active zone in which the core comprises fuel assemblies	G21C 3/326
Shock absorbers per se	F16F

G21C 5/06

Means for locating or supporting fuel elements {(means forming part of the element [G21C 3/12](#))}

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Fuel element	fuel assembly
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G21C 7/00

Control of nuclear reaction

References

Limiting references

This place does not cover:

Control of nuclear power plant in general	G21D 3/00
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Boron and boron compounds per se	C01B 35/00
Ceramic materials per se	C04B 35/00
Alloys per se	C22C
Gearing in general	F16H
Safety arrangements for control of regulating systems in general	G05B 9/00
Control and regulating systems in general	G05B 23/00
Safety systems for the nuclear power plant in general	G21D 3/04
Neutron sources per se	G21G 4/02
Emergency protective circuit arrangements in general	H02H
Dynamo electric machines in general	H02K
Pulse techniques	H03K

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](#))

References

Limiting references

This place does not cover:

Emergency cooling arrangements; removing shut-down heat	G21C 15/18
Safety systems of the nuclear power plant in general	G21D 3/04

Informative references

Attention is drawn to the following places, which may be of interest for search:

Recombiners in nuclear installations	G21C 19/317
Processes and reactors using catalytically active bodies for gas/gas reactions	B01J 12/007
Blast shield in general	F42D 5/00

G21C 11/00

Shielding structurally associated with the reactor

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Thermal insulation of pipes in general	F16L 59/00
Shielding in general	G21F

G21C 13/036

the tube passing through the vessel wall, i.e. continuing on both sides of the wall

Definition statement

This place covers:

Repairing means and methods thereof.

References

Limiting references

This place does not cover:

Processes of utilising sub-atmospheric or super-atmospheric pressure to effect chemical or physical change of matter and apparatus thereof, i.e. vessels for chemical or physical process	B01J 3/00
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Pressure vessels in general	F16J 12/00
Vessels for storing gases	F17C

Informative references

Attention is drawn to the following places, which may be of interest for search:

Joints for pipes in general	F16L
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G21C 15/00

**Cooling arrangements within the pressure vessel containing the core;
Selection of specific coolants**

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Emergency protection arrangements strictly associated with the reactor, other than cooling	G21C 9/00
Pumps in general	F04
Jet pumps per se	F04F 5/00
Ventilation means per se	F24F
Safety arrangements of the nuclear power plant in general	G21D 3/04

G21C 15/18

Emergency cooling arrangements; Removing shut-down heat

Definition statement

This place covers:

Using passive systems, i.e. systems not requiring the use of active means such as pumps; examples: natural circulation; gravity.

G21C 15/182

{comprising powered means, e.g. pumps}

Definition statement

This place covers:

Using active means such as pumps.

G21C 17/00

Monitoring; Testing (measuring in general [G01](#)); {Maintaining}

Definition statement

This place covers:

Monitoring/measuring/testing devices and methods strictly associated to nuclear fission reactors and their components.

Further information:

The subgroup [G21C 17/06](#) also covers devices and methods for maintaining (e.g. cleaning) fuel elements or fuel assemblies.

References

Limiting references

This place does not cover:

Safety arrangements for control of regulating systems in general	G05B 9/00
Monitoring or testing of control or regulating systems in general	G05B 23/00
Electrical digital data processing	G06F
Systems and methods, specially adapted for business purposes and their data processing	G06Q
Time or attendance register; registering or indicating the working of machines	G07C

Informative references

Attention is drawn to the following places, which may be of interest for search:

Pipes in general	F16L
Pipes in steam generators	F22B 37/002
Arrangements for sealing leaking tubes and conduits in general	F28F 11/00
Measuring in general	G01
Measuring linear dimensions, angles, areas, irregularities of surfaces or contours	G01B
Investigating fluid tightness of structures	G01M 3/00
Investigating or analysing materials by determining their chemical or physical properties	G01N
Material analysis/investigation with ultrasonic, sonic or infrasonic waves	G01N 29/00
Measuring neutron radiation per se	G01T 3/00
Computer implemented systems and methods of testing, simulating and designing nuclear fission reactors or parts thereof	G21D 3/001

G21C 19/10

Lifting devices or pulling devices adapted for co-operation with fuel elements or with control elements (manipulators [B25J](#))

Definition statement

This place covers:

Loading and unloading of fuel assemblies to and from the reactor core.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Reprocessing of irradiated fuel	G21C 19/42
Storage rack for spent fuel casks	G21F 5/012
Treating/decontaminating radioactively contaminated materials	G21F 9/00

G21C 19/42

Reprocessing of irradiated fuel

Definition statement

This place covers:

All aspects of the reprocessing of irradiated nuclear fuel, either aqueous or non-aqueous processes.

References

Limiting references

This place does not cover:

Decommissioning of reactors	G21D 1/003
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Treating radioactively contaminated material	G21F 9/00
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Synonyms and Keywords

In patent documents, the following abbreviations are often used:

PUREX	Plutonium Uranium Refining by Extraction
COEX	Coextraction of Plutonium together with Uranium

G21C 21/00

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

References

Limiting references

This place does not cover:

Manufacture of spacer grids	G21C 3/3424
Apparatus or processes for manufacturing in general	Section B , e.g. B23

G21C 23/00

Adaptations of reactors to facilitate experimentation or irradiation

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Irradiation loops in subcritical reactors	G21C 1/306
Arrangements for converting chemical elements by electromagnetic radiation in nuclear reactors	G21G 1/02