

CPC**COOPERATIVE PATENT CLASSIFICATION****F24J****PRODUCING OR USE OF HEAT NOT OTHERWISE PROVIDED FOR**

(materials therefor [C09K 5/00](#); engines or other mechanisms for producing mechanical power from heat, see the relevant classes, e.g. [F03G](#) for using natural heat)

F24J 1/00

Apparatus or devices using heat produced by exothermal chemical reactions other than by combustion (for cooking-vessels [A47J 36/28](#); self-heating compresses [A61F](#) { [A61F 7/03](#) }; materials for the production of heat or cold involving non-reversible chemical reactions, other than by combustion, when used [C09K 5/18](#))

F24J 2/00

Use of solar heat, e.g. solar heat collectors (distillation or evaporation of water using solar energy [C02F 1/14](#); devices for producing mechanical power from solar energy [F03G 6/00](#); semiconductor devices adapted for converting solar energy into electrical energy [H01L 25/00](#), [H01L 31/04](#); semiconductor devices including arrays of solar cells using heat energy [H01L 31/058](#); generators in which light radiation is directly converted into electrical energy [H02N 6/00](#))

F24J 2/0007

- . { Passive solar heat collectors }

F24J 2/0015

- . { Solar heat collectors absorbing essentially direct solar radiation combined with a solar heat collector absorbing concentrated radiation }

F24J 2/0023

- . { Solar heat collector using additional ambient air heat or another heat source, e.g. electrical }

F24J 2002/003

- . { Heat traps }

F24J 2002/0038

- . { Solar modules layout; Modular arrangements }

F24J 2002/0046

- .. { in the form of multiple rows and multiple columns, all solar modules being coplanar }

F24J 2002/0053

- .. { Coplanar arrangements with frame overlapping portions }

F24J 2002/0061

- .. { Overlaying arrangements similar to roof tiles }

F24J 2002/0069

- .. { Stepped arrangements, e.g. in parallel planes, without module overlapping }

F24J 2002/0076

- .. { Non-parallel arrangements }

F24J 2002/0084

- .. { Preventing shading effects }

F24J 2002/0092

- .. { Arrangements of solar thermal modules combined with solar PV modules }

F24J 2/02

- . Solar heat collectors with support for article heated, e.g. stoves, ranges, crucibles, furnaces or ovens using solar heat

F24J 2/04

- . Solar heat collectors having working fluid conveyed through collector

F24J 2002/0405

- .. { having a particular shape, e.g. prismatic, pyramidal }

F24J 2002/0411

- ... { in the form of louvers }

F24J 2002/0416

- ... { allowing change of position for optimization of heat collection }

F24J 2/0422

- .. { Solar collectors integrated in fixed constructions, e.g. in buildings }

F24J 2/0427	...	{ in the form of a fence, a balustrade or a handrail }
F24J 2/0433	...	{ in the form of a window }
F24J 2/0438	...	{ in the form of a floor construction }
F24J 2/0444	...	{ in the form of a façade construction }
F24J 2/045	...	{ in the form of a roof construction (F24J 2/0455 takes precedence)}
F24J 2/0455	...	{ in the form of shingles or tiles }
F24J 2/0461	..	{ using pools or ponds }
F24J 2/0466	...	{ Salt gradient solar ponds }
F24J 2/0472	...	{ Floating solar collectors or covers }
F24J 2/0477	..	{ having circuits for more than one working fluid (F24J 2/30 takes precedence)}
F24J 2/0483	..	{ having two or more passages for the same working fluid (F24J 2/20 , F24J 2/24 take precedence)}
F24J 2/0488	..	{ Solar heat collectors having absorber surfaces of a particular form }
F24J 2/0494	...	{ having two or more absorber surfaces }
F24J 2/05	..	surrounded by a transparent enclosure, e.g. evacuated solar collectors
F24J 2/055	...	{ the enclosure being cylindrical }
F24J 2/06	..	having concentrating elements (optical elements or systems per se G02B)
F24J 2/062	...	{ Prisms }
F24J 2/065	...	{ Fluorescent material }
F24J 2/067	...	{ Light guides }
F24J 2/07	...	Receivers working at high temperature, e.g. for solar power plants
F24J 2002/075	....	{ movable or adjustable }
F24J 2/08	...	having lenses as concentrating elements
F24J 2/085	....	{ having discontinuous faces, e.g. Fresnel lenses }
F24J 2/10	...	having reflectors as concentrating elements
F24J 2002/1004	....	{ Special shape not covered by F24J 2/1047 - F24J 2/18 }
F24J 2002/1009	.....	{ corrugated }
F24J 2002/1014	.....	{ curved }
F24J 2002/1019	.....	{ dish-shaped }
F24J 2002/1023	.....	{ trough-shaped }
F24J 2002/1028	.....	{ asymmetric }
F24J 2002/1033	.....	{ spiral }
F24J 2002/1038	.....	{ hyperbolic }
F24J 2002/1042	.....	{ involutes }
F24J 2/1047	....	{ having discontinuous faces }
F24J 2/1052	....	{ flexible (F24J 2/125 , F24J 2/145 take precedence)}
F24J 2/1057	....	{ characterised by the material or the construction of the reflector }
F24J 2002/1061	....	{ Reflective elements inside solar collector casings }
F24J 2002/1066	....	{ Micro-reflectors }
F24J 2002/1071	....	{ in the form of reflective coatings }

F24J 2002/1076	....	{ Reflectors layout }
F24J 2002/108	.....	{ Assemblies of spaced reflective elements on common support, e.g. Fresnel reflectors }
F24J 2002/1085	.....	{ Reflectors formed by assemblies of adjacent similar reflective facets }
F24J 2002/109	.....	{ Reflectors formed by assemblies of adjacent reflective elements having different orientation or different features }
F24J 2002/1095	.....	{ Assemblies of spaced reflective elements in the form of grids, e.g. vertical or inclined reflective elements extending over heat absorbing elements }
F24J 2/12	....	parabolic
F24J 2/125	.....	{ flexible }
F24J 2/13	....	hemispherical
F24J 2/14	....	semi-cylindrical or cylindro-parabolic
F24J 2/145	.....	{ flexible }
F24J 2/15	....	conical
F24J 2/16	....	having flat plates
F24J 2/18	....	spaced, opposed interacting reflecting surfaces
F24J 2/20	..	the working fluid being conveyed between plates
F24J 2/201	...	{ having conduits of plastic material }
F24J 2/202	...	{ having conduits formed by paired plates and internal partition means }
F24J 2/204	...	{ having conduits formed by paired plates, only one of which is plane }
F24J 2/205	...	{ having conduits formed by paired non-plane plates }
F24J 2/207	...	{ having curved plate-like conduits, e.g. semi-spherical }
F24J 2/208	...	{ having conduits formed by inflation of portions of a pair of joined sheets }
F24J 2/22	...	having extended surfaces, e.g. protrusions, corrugations (F24J 2/28 takes precedence)
F24J 2/23	..	the working fluid trickling freely { or flowing in a continuous film } over collector elements
F24J 2/24	..	the working fluid being conveyed through tubular heat absorbing conduits
F24J 2002/241	...	{ the conduits having a non-circular cross-section }
F24J 2/242	...	{ the tubular conduits being integrated in a block; the tubular conduits touching each other }
F24J 2/243	...	{ the tubular conduits being of plastic material }
F24J 2/244	...	{ the tubular conduits are not fixed to heat absorbing plates and are not touching each other }
F24J 2/245	....	{ the conduits being parallel to each other }
F24J 2/246	....	{ the conduits being helically coiled }
F24J 2/247	....	{ the conduits being spirally coiled }
F24J 2/248	....	{ the conduits being otherwise bent, e.g. zig-zag }
F24J 2/26	...	having extended surfaces, e.g. protrusions (F24J 2/28 takes precedence)
F24J 2002/261	....	{ Special fins }
F24J 2002/263	.....	{ extending obliquely }

- F24J 2/265 { the conduits being parallel to each other }
- F24J 2/266 { the conduits being spirally coiled }
- F24J 2/268 { the conduits being otherwise bent, e.g. zig-zag }
- F24J 2/28 . . having permeable mass, foraminous or porous materials
- F24J 2/30 . . with means to exchange heat between plural fluids
- F24J 2/32 . . having evaporator and condenser section, e.g. heat pipe
- F24J 2/34 . . having heat storage mass
- F24J 2/345 . . . { Hot water storage }

- F24J 2/36 . Rollable or foldable collector units

- F24J 2/38 . employing tracking means (F24J 2/02, F24J 2/06 take precedence; direction- finders for determining the direction from which electromagnetic waves are being received G01S 3/78 { , e.g. solar tracking systems G01S 3/7861 }; control of position or direction G05D 3/00 { , e.g. G05D 3/105 })

- F24J 2002/385 . . { Calibration means; Methods for initial positioning of solar concentrators or solar receivers }

- F24J 2/40 . Control arrangements; { Control of position for tracking F24J 2/38 }
- F24J 2/402 . . { responsive to temperature }
- F24J 2/405 . . { responsive to wind }
- F24J 2/407 . . { for controlling transmission of solar radiation }

- F24J 2/42 . Solar heat systems not otherwise provided for {(solar heat systems in greenhouses A01G 9/243; distillation by solar energy C02F 1/14; devices for producing mechanical power from solar energy F03G 6/00; central heat systems using heat solar energy F24D 11/003, F24D 11/007, F24D 11/0221, F24D 11/0264; domestic hot-water supply systems using solar energy F24D 17/0015, F24D 17/0042, F24D 17/0063; air-conditioning systems using solar energy F24F 5/0046; refrigeration machines, plants or systems using solar energy F25B 27/002; drying solid materials or objects by radiation, e.g. from the sun F26B 3/28)}

- F24J 2/423 . . { for swimming pools }
- F24J 2/426 . . { for showers }
- F24J 2/44 . . having thermosiphonic circulation

- F24J 2/46 . Component parts, details or accessories of solar heat collectors
- F24J 2002/4601 . . { Arrangements for heat transfer optimization }
- F24J 2002/4603 . . . { Flow guiding means; Inserts inside conduits }
- F24J 2002/4605 . . . { Arrangements for one-way heat transfer, e.g. thermal diodes }
- F24J 2/4607 . . { Safety or protection arrangements; Arrangements for preventing malfunction; Auxiliary devices, e.g. means for testing (control means F24J 2/40)}
- F24J 2/4609 . . . { Protective covers, lids; closure members (F24J 2/50 takes precedence)}
- F24J 2/461 . . . { Means for cleaning or for removing snow }
- F24J 2/4612 . . . { Means for preventing corrosion or protecting against contaminants, e.g. preventing condensations }
- F24J 2/4614 { for draining rain water }

F24J 2/4616	....	{ for maintaining vacuum, e.g. by using getters }
F24J 2/4618	....	{ for preventing condensation }
F24J 2/462	....	{ for deaerating or degassing the working fluid }
F24J 2/4621	...	{ Means for overtemperature protection (arrangements for draining the working fluid: F24J 2/4634); Means for overpressure protection }
F24J 2/4623	....	{ Arrangements for modifying heat collecting features, e.g. by defocusing or by changing the position of heat receiving elements }
F24J 2/4625	....	{ Cooling arrangements, e.g. by using external heat dissipating means or internal cooling circuits (F24J 2/4627 takes precedence)}
F24J 2/4627	....	{ Arrangements for venting solar collector enclosures }
F24J 2/4629	....	{ Arrangements for preventing overpressure inside solar collector enclosures (F24J 2/4627 takes precedence)}
F24J 2/463	....	{ Arrangements for preventing overpressure inside solar collector circuits }
F24J 2/4632	...	{ Means for freezing protection (arrangements for draining the working fluid: F24J 2/4634)}
F24J 2/4634	...	{ Arrangements for draining the working fluid }
F24J 2/4636	...	{ Arrangements to accommodate differential expansion of solar collector elements }
F24J 2/4638	...	{ Arrangements for protecting solar collectors against adverse weather conditions (F24J 2/4609 takes precedence)}
F24J 2/464	..	{ Casings }
F24J 2/4641	...	{ characterised by using specific material }
F24J 2/4643	....	{ Plastic materials }
F24J 2/4645	....	{ Metallic materials }
F24J 2/4647	..	{ Means for fluidically interconnecting different solar collectors or for connecting solar connectors with other components; Headers; Fluid distributing means }
F24J 2/4649	..	{ Selection of particular working medium (materials for heat transfer C09K 5/00)}
F24J 2/465	..	{ Arrangements of sealing means }
F24J 2/4652	..	{ Solar heat collectors having absorber surfaces provided with special coatings, e.g. anti-reflective coatings }
F24J 2/4654	..	{ Materials for the heat-exchange conduits (F24J 2/201 , F24J 2/243 , F24J 2/48 take precedence)}
F24J 2002/4656	..	{ Arrangements for reinforcement of solar collector elements }
F24J 2002/4658	..	{ Fastening; Joining }
F24J 2002/4659	...	{ by using hook and loop-type fasteners }
F24J 2002/4661	...	{ by using hooks }
F24J 2002/4663	...	{ by clamping }
F24J 2002/4665	...	{ by clipping, e.g. by using snap connectors }
F24J 2002/4667	...	{ by screwed connection }
F24J 2002/4669	...	{ by using threaded elements, e.g. stud bolts }
F24J 2002/467	...	{ by using form-fitting connection means, e.g. tongue and groove }
F24J 2002/4672	...	{ by using toothed elements }
F24J 2002/4674	...	{ by deforming the material, e.g. by crimping or clinching }

F24J 2002/4676	...	{ by bonding, e.g. by using adhesives }
F24J 2002/4678	...	{ by welding or brazing }
F24J 2002/4679	...	{ Joining different materials }
F24J 2002/4681	....	{ Joining glass with non-glass elements }
F24J 2002/4683	..	{ Selection of particular materials }
F24J 2002/4685	...	{ Ceramics }
F24J 2002/4687	...	{ Concrete }
F24J 2002/4689	...	{ Foams }
F24J 2002/469	...	{ Carbone, e.g. graphite }
F24J 2002/4692	...	{ Plastics }
F24J 2002/4694	...	{ Textiles; Fabrics }
F24J 2002/4696	...	{ Natural materials, e.g. wood }
F24J 2002/4698	...	{ Recycled materials }
F24J 2/48	..	characterised by absorber material
F24J 2/481	...	{ of metallic material (F24J 2/487 takes precedence)}
F24J 2/482	...	{ of plastic (F24J 2/488 takes precedence)}
F24J 2/484	...	{ of ceramic; of concrete; of natural stone (F24J 2/485 takes precedence)}
F24J 2/485	...	{ using absorber coatings (radiation-absorbing paints C09D 5/32)}
F24J 2/487	....	{ of metallic material }
F24J 2/488	....	{ of plastic material }
F24J 2/50	..	Transparent coverings
F24J 2002/501	...	{ Special shape }
F24J 2002/502	....	{ in the form of multiple covering elements }
F24J 2002/503	....	{ in the form of curved covering elements }
F24J 2/505	...	{ characterised by using specific material }
F24J 2/506	....	{ plastic material }
F24J 2/507	...	{ using evacuated elements (F24J 2/05 takes precedence)}
F24J 2002/508	...	{ Transparent insulation; Convection preventing members }
F24J 2/51	..	Thermal insulation (F24J 2/50 takes precedence)
F24J 2/515	...	{ characterised by the material }
F24J 2/52	..	Arrangement of mountings or supports
F24J 2/5201	...	{ Stationary supporting structures for solar modules; Load-bearing elements for movable supporting structures }
F24J 2/5203	....	{ comprising elongated rigid mounting elements, e.g. mounting profiles or rails for covering a building surface with solar modules; Module frames (F24J 2/523 takes precedence)}
F24J 2/5205	.....	{ Substantially planar profile assemblies, e.g. grids comprising coplanar profiles or stacked profiles }
F24J 2/5207	.....	{ comprising profiles of particular shape having in cross-section first and second module supporting portions for coupling adjacent solar modules }

F24J 2/5209	.....	{ Substantially coplanar profile assemblies comprising longitudinal profiles laterally coupled with transversal profiles }
F24J 2/5211	.....	{ Solar module peripheral frames }
F24J 2002/5213	.....	{ Special profiles }
F24J 2002/5215	.....	{ having hollow parts with closed cross-section }
F24J 2002/5216	.....	{ having circular or oval cross-section }
F24J 2002/5218	.....	{ having a central web, e.g. I-shaped, inverted T- shaped }
F24J 2002/522	.....	{ U-, C- or O-shaped; Hat profiles }
F24J 2002/5222	.....	{ in the form of corrugated profiles }
F24J 2002/5224	.....	{ having curved portions }
F24J 2002/5226	.....	{ having undercut grooves }
F24J 2/5228	....	{ comprising plate-like mounting elements, e.g. profiled or corrugated plates; Plate-like module frames (F24J 2/523 takes precedence)}
F24J 2/523	....	{ comprising elongated standing elements, e.g. posts, legs; Standing structures for supporting solar modules at defined orientation; Three-dimensional frameworks; Volumetric supporting structures, e.g. box-like elements or shaped bodies }
F24J 2/5232	.....	{ Posts coupled with upper profiles }
F24J 2/5233	.....	{ Profile arrangements, e.g. assemblies of base profiles with vertical or inclined profiles, three-dimensional frameworks (F24J 2/5232 takes precedence)}
F24J 2/5235	.....	{ comprising bent plates or assemblies of plates }
F24J 2/5237	.....	{ comprising shaped bodies, e.g. molded box-like elements, concrete elements, foamed elements; Massive supporting structures }
F24J 2/5239	.....	{ Interconnected assemblies of stands; Stands having first and second module supporting portions for coupling adjacent modules }
F24J 2/5241	....	{ comprising elongated non rigid elements, e.g. straps, wires, ropes }
F24J 2/5243	....	{ Fixation means, e.g. connectors or fasteners }
F24J 2/5245	.....	{ Connectors for anchoring solar modules or supporting elements to the ground or to building structures }
F24J 2/5247	.....	{ in the form of bent strips or assemblies of strips; Hook-like connectors; Connectors to be mounted between building covering elements }
F24J 2/5249	.....	{ for anchoring to protrusions of buildings, e.g. to corrugations or to standing seams }
F24J 2/525	.....	{ Ground anchoring means; Foundations for supporting elements; Massive elements for anchoring supporting structures to the ground or to flat horizontal surfaces }
F24J 2/5252	.....	{ Connectors for fixing solar modules, or solar module peripheral frames to supporting elements, e.g. to profiled mounting members }
F24J 2/5254	.....	{ Solar module side connectors or base connectors }
F24J 2/5256	.....	{ Clamping or clipping elements }
F24J 2/5258	.....	{ with clamping action by using screw-threaded elements }
F24J 2/526	.....	{ Connectors for coupling adjacent supporting elements together, e.g. profile to profile connectors }

F24J 2/5262	.....	{ Connectors for coupling adjacent solar modules or solar module peripheral frames together (F24J 2/5252 takes precedence)}
F24J 2/5264	....	{ comprising means for adjusting the final position or the final orientation of a supporting element relative to another one or relative to a mounting surface; comprising means for compensating mounting tolerances }
F24J 2/5266	...	{ adapted for non-rotary movement }
F24J 2/5267	...	{ Waterborne solar collectors }
F24J 2/5269	....	{ Moving platforms }
F24J 2/5271	...	{ Airborne solar collectors, e.g. using inflated structures (F24J 2/0472 , F24J 2/5267 take precedence)}
F24J 2002/5273	...	{ Details; Special support components or methods }
F24J 2002/5275	....	{ Arrangements for mounting elements inside solar collectors; Spacers inside solar collectors }
F24J 2002/5277	....	{ Foldable support elements }
F24J 2002/5279	....	{ Stackable support elements }
F24J 2002/5281	....	{ Methods for installing support elements }
F24J 2002/5283	....	{ Supports with play between elements }
F24J 2002/5284	....	{ Filling or spacing means; Elastic means }
F24J 2002/5286	....	{ Tensioning means }
F24J 2002/5288	....	{ Means for preventing movements, e.g. stops }
F24J 2002/529	....	{ Means for accommodating irregularities on mounting surface; Tolerance compensation means }
F24J 2002/5292	....	{ Ballasting means }
F24J 2002/5294	....	{ Sealing means between support elements and mounting surface }
F24J 2002/5296	....	{ Sealing means between support elements, e.g. overlapping arrangements; Gap closing arrangements }
F24J 2002/5298	....	{ Means for preventing theft; Locking means }
F24J 2/54	...	specially adapted for rotary movement {(F24J 2/5269 takes precedence)}
F24J 2/5403	....	{ with only one rotation axis }
F24J 2/5406	.....	{ with vertical axis }
F24J 2/541	.....	{ with horizontal axis }
F24J 2/5413	.....	{ with inclined axis }
F24J 2/5417	....	{ with two rotation axis }
F24J 2/542	.....	{ with vertical primary axis }
F24J 2/5424	.....	{ with horizontal primary axis }
F24J 2/5427	.....	{ with inclined primary axis }
F24J 2/5431	....	{ with more than two rotation axis or with multiple degrees of freedom }
F24J 2002/5434	....	{ Special components }
F24J 2002/5437	.....	{ Driving means }
F24J 2002/5441	.....	{ hydraulic or pneumatic }
F24J 2002/5444	.....	{ Coupling means }
F24J 2002/5448	.....	{ Transmissions }

F24J 2002/5451	.....	{ in the form of articulated bars }
F24J 2002/5455	.....	{ in the form of compasses, scissors or parallelograms }
F24J 2002/5458	.....	{ in the form of flexible elements, e.g. belts, chains, ropes }
F24J 2002/5462	.....	{ in the form of gearings or rack-and-pinion transmissions }
F24J 2002/5465	.....	{ in the form of threaded elements }
F24J 2002/5468	.....	{ for moving several solar collectors by common transmission elements }
F24J 2002/5472	.....	{ for deriving one movement from another one, e.g. for deriving elevation movement from azimuth movement }
F24J 2002/5475	.....	{ Movement guiding means }
F24J 2002/5479	.....	{ Tracks }
F24J 2002/5482	.....	{ Bearings }
F24J 2002/5486	.....	{ Hinged elements; Pin connections }
F24J 2002/5489	.....	{ Spherical joints }
F24J 2002/5493	.....	{ Load balancing means, e.g. use of counter-weights }
F24J 2002/5496	.....	{ Movement dampening means; Braking means }

F24J 3/00 **Other production or use of heat, not derived from combustion** (use of solar heat [F24J 2/00](#))

F24J 3/003	.	{ using heat resulting from internal friction of a moving fluid or from friction between a fluid and a moving body }
F24J 3/006	..	{ the fluid passing through a restriction means }
F24J 3/06	.	using natural heat
F24J 3/08	..	using geothermal heat
F24J 3/081	...	{ by circulating a working fluid through underground channels, the working fluid not coming into direct contact with the ground }
F24J 3/082	....	{ Compact tube assemblies inserted into the ground, e.g. geothermal probes }
F24J 3/083	.....	{ in the form of bent tubes or in the form of tubes assembled with connectors or with return headers }
F24J 3/084	.....	{ in the form of tubes being closed at one end, i.e. return type }
F24J 3/085	...	{ by injecting a working fluid directly into the ground or by using underground water, e.g. systems using injection and recovery wells }
F24J 3/086	...	{ by injecting a working fluid into a closed well; by using intermediate working fluids, e.g. by using heat pipes }
F24J 2003/087	...	{ Component parts, details or accessories }
F24J 2003/088	....	{ Methods for installation }
F24J 2003/089	....	{ Control arrangements }

F24J 2200/00 **Prediction; Simulation**

- F24J 2200/04 . for solar techniques
- F24J 2200/06 . for geothermal techniques