

**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 ( <a href="#">F24J 2/0455</a> 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 ( <a href="#">F24J 2/30</a> takes precedence)}
F24J 2/0483	..	{ having two or more passages for the same working fluid ( <a href="#">F24J 2/20</a> , <a href="#">F24J 2/24</a> 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 ( <a href="#">optical elements or systems per se G02B</a> )
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 <a href="#">F24J 2/1047</a> - <a href="#">F24J 2/18</a> }
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	.....	{involututes }
F24J 2/1047	....	{having discontinuous faces}
F24J 2/1052	....	{ flexible ( <a href="#">F24J 2/125</a> , <a href="#">F24J 2/145</a> 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 ( <a href="#">F24J 2/28</a> 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 ( <a href="#">F24J 2/28</a> 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: <a href="#">F24J 2/4634</a> ); 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 ( <a href="#">F24J 2/4627</a> takes precedence)}
F24J 2/4627	....	{ Arrangements for venting solar collector enclosures}
F24J 2/4629	....	{ Arrangements for preventing overpressure inside solar collector enclosures ( <a href="#">F24J 2/4627</a> 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: <a href="#">F24J 2/4634</a> )}
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 ( <a href="#">F24J 2/4609</a> 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 <a href="#">C09K 5/00</a> )}
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 ( <a href="#">F24J 2/201</a> , <a href="#">F24J 2/243</a> , <a href="#">F24J 2/48</a> 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 ( <a href="#">F24J 2/487</a> takes precedence)}
F24J 2/482	...	{of plastic ( <a href="#">F24J 2/488</a> takes precedence)}
F24J 2/484	...	{of ceramic; of concrete; of natural stone ( <a href="#">F24J 2/485</a> takes precedence)}
F24J 2/485	...	{using absorber coatings ( <a href="#">radiation-absorbing paints C09D 5/32</a> )}
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 ( <a href="#">F24J 2/05</a> takes precedence)}
F24J 2002/508	...	{Transparent insulation; Convection preventing members }
F24J 2/51	..	Thermal insulation ( <a href="#">F24J 2/50</a> 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 ( <a href="#">F24J 2/523</a> 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 ( <a href="#">F24J 2/523</a> 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 ( <a href="#">F24J 2/5232</a> 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 ( <a href="#">F24J 2/5252</a> 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 ( <a href="#">F24J 2/0472</a> , <a href="#">F24J 2/5267</a> 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 {( <a href="#">F24J 2/5269</a> 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