

CPC COOPERATIVE PATENT CLASSIFICATION

F MECHANICAL ENGINEERING; LIGHTING; HEATING; WEAPONS; BLASTING (NOTE omitted)

LIGHTING; HEATING

F24 HEATING; RANGES; VENTILATING (protecting plants by heating in gardens, orchards, or forests [A01G 13/06](#); baking ovens and apparatus [A21B](#); cooking devices other than ranges [A47J](#); forging [B21J](#), [B21K](#); specially adapted for vehicles, [see the relevant subclasses of B60 - B64](#); combustion apparatus in general [F23](#); drying [F26B](#); ovens in general [F27](#); electric heating elements and arrangements [H05B](#))
(NOTE omitted)

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)

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 7/03 ; materials for the production of heat or cold involving non-reversible chemical reactions, other than by combustion, when used C09K 5/18)	2002/0092	. . {Arrangements of solar thermal modules combined with solar PV modules}
		2/02	. Solar heat collectors with support for article heated, e.g. stoves, ranges, crucibles, furnaces or ovens using solar heat
		2/04	. Solar heat collectors having working fluid conveyed through collector
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 specially adapted for converting solar energy into electrical energy H01L 31/00 ; photovoltaic [PV] cells including means directly associated with the PV cell to utilise heat energy H01L 31/0525 ; PV modules including means associated with the PV module to utilise heat energy H02S 40/44)	2002/0405	. . {having a particular shape, e.g. prismatic, pyramidal}
		2002/0411	. . . {in the form of louvers}
		2002/0416	. . . {allowing change of position for optimization of heat collection}
		2/0422	. . {Solar collectors integrated in fixed constructions, e.g. in buildings}
		2/0427	. . . {in the form of a fence, a balustrade or a handrail}
		2/0433	. . . {in the form of a window}
		2/0438	. . . {in the form of a floor construction}
		2/0444	. . . {in the form of a façade construction}
		2/045	. . . {in the form of a roof construction (F24J 2/0455 takes precedence)}
		2/0455	. . . {in the form of shingles or tiles}
		2/0461	. . {using pools or ponds}
		2/0466	. . . {Salt gradient solar ponds}
		2/0472	. . . {Floating solar collectors or covers}
		2/0477	. . {having circuits for more than one working fluid (F24J 2/30 takes precedence)}
		2/0483	. . {having two or more passages for the same working fluid (F24J 2/20 , F24J 2/24 take precedence)}
		2/0488	. . {Solar heat collectors having absorber surfaces of a particular form}
		2/0494	. . . {having two or more absorber surfaces}
		2/05	. . surrounded by a transparent enclosure, e.g. evacuated solar collectors
		2/055	. . . {the enclosure being cylindrical}
		2/06	. . having concentrating elements (optical elements or systems per se G02B)
		2/062	. . . {Prisms}
		2/065	. . . {Fluorescent material}
2/0007	. {Passive solar heat collectors}		
2/0015	. {Solar heat collectors absorbing essentially direct solar radiation combined with a solar heat collector absorbing concentrated radiation}		
2/0023	. {Solar heat collector using additional ambient air heat or another heat source, e.g. electrical}		
2002/003	. {Heat traps}		
2002/0038	. {Solar modules layout; Modular arrangements}		
2002/0046	. . {in the form of multiple rows and multiple columns, all solar modules being coplanar}		
2002/0053	. . {Coplanar arrangements with frame overlapping portions}		
2002/0061	. . {Overlaying arrangements similar to roof tiles}		
2002/0069	. . {Stepped arrangements, e.g. in parallel planes, without module overlapping}		
2002/0076	. . {Non-parallel arrangements}		
2002/0084	. . {Preventing shading effects}		

- 2/067 . . . {Light guides}
- 2/07 . . . Receivers working at high temperature, e.g. for solar power plants
- 2002/075 {movable or adjustable}
- 2/08 . . . having lenses as concentrating elements
- 2/085 {having discontinuous faces, e.g. Fresnel lenses}
- 2/10 . . . having reflectors as concentrating elements
- 2002/1004 {Special shape not covered by [F24J 2/1047](#) - [F24J 2/18](#)}
- 2002/1009 {corrugated}
- 2002/1014 {curved}
- 2002/1019 {dish-shaped}
- 2002/1023 {trough-shaped}
- 2002/1028 {asymmetric}
- 2002/1033 {spiral}
- 2002/1038 {hyperbolic}
- 2002/1042 {involutives}
- 2/1047 {having discontinuous faces}
- 2/1052 {flexible ([F24J 2/125](#), [F24J 2/145](#) take precedence)}
- 2/1057 {characterised by the material or the construction of the reflector}
- 2002/1061 {Reflective elements inside solar collector casings}
- 2002/1066 {Microreflectors}
- 2002/1071 {in the form of reflective coatings}
- 2002/1076 {Reflectors layout}
- 2002/108 {Assemblies of spaced reflective elements on common support, e.g. Fresnel reflectors}
- 2002/1085 {Reflectors formed by assemblies of adjacent similar reflective facets}
- 2002/109 {Reflectors formed by assemblies of adjacent reflective elements having different orientation or different features}
- 2002/1095 {Assemblies of spaced reflective elements in the form of grids, e.g. vertical or inclined reflective elements extending over heat absorbing elements}
- 2/12 parabolic
- 2/125 {flexible}
- 2/13 hemispherical
- 2/14 semi-cylindrical or cylindro-parabolic
- 2/145 {flexible}
- 2/15 conical
- 2/16 having flat plates
- 2/18 spaced, opposed interacting reflecting surfaces
- 2/20 . . the working fluid being conveyed between plates
- 2/201 . . . {having conduits of plastic material}
- 2/202 . . . {having conduits formed by paired plates and internal partition means}
- 2/204 . . . {having conduits formed by paired plates, only one of which is plane}
- 2/205 . . . {having conduits formed by paired non-plane plates}
- 2/207 . . . {having curved plate-like conduits, e.g. semi-spherical}
- 2/208 . . . {having conduits formed by inflation of portions of a pair of joined sheets}
- 2/22 . . . having extended surfaces, e.g. protrusions, corrugations ([F24J 2/28](#) takes precedence)
- 2/23 . . the working fluid trickling freely {or flowing in a continuous film} over collector elements
- 2/24 . . the working fluid being conveyed through tubular heat absorbing conduits
- 2002/241 . . . {the conduits having a non-circular cross-section}
- 2/242 . . . {the tubular conduits being integrated in a block; the tubular conduits touching each other}
- 2/243 . . . {the tubular conduits being of plastic material}
- 2/244 . . . {the tubular conduits are not fixed to heat absorbing plates and are not touching each other}
- 2/245 {the conduits being parallel to each other}
- 2/246 {the conduits being helically coiled}
- 2/247 {the conduits being spirally coiled}
- 2/248 {the conduits being otherwise bent, e.g. zig-zag}
- 2/26 . . . having extended surfaces, e.g. protrusions ([F24J 2/28](#) takes precedence)
- 2002/261 {Special fins}
- 2002/263 {extending obliquely}
- 2/265 {the conduits being parallel to each other}
- 2/266 {the conduits being spirally coiled}
- 2/268 {the conduits being otherwise bent, e.g. zig-zag}
- 2/28 . . having permeable mass, foraminous or porous materials
- 2/30 . . with means to exchange heat between plural fluids
- 2/32 . . having evaporator and condenser section, e.g. heat pipe
- 2/34 . . having heat storage mass
- 2/345 . . . {Hot water storage}
- 2/36 . Rollable or foldable collector units
- 2/38 . employing tracking means ([F24J 2/02](#), [F24J 2/06](#) take precedence; rotary supports or mountings therefor [F24J 2/54](#); supporting structures of photovoltaic modules for generation of electric power specially adapted for solar tracking systems [H02S 20/32](#))
- 2002/385 . . {Calibration means; Methods for initial positioning of solar concentrators or solar receivers}
- 2/40 . Control arrangements{ ([control of position for tracking F24J 2/38](#))}
- 2/402 . . {responsive to temperature}
- 2/405 . . {responsive to wind}
- 2/407 . . {for controlling transmission of solar radiation}
- 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](#))}
- 2/423 . . {for swimming pools}
- 2/426 . . {for showers}

- 2/44 . . having thermosiphonic circulation
- 2/46 . Component parts, details or accessories of solar heat collectors
- 2002/4601 . . {Arrangements for heat transfer optimization}
- 2002/4603 . . . {Flow guiding means; Inserts inside conduits}
- 2002/4605 . . . {Arrangements for one-way heat transfer, e.g. thermal diodes}
- 2/4607 . . {Safety or protection arrangements; Arrangements for preventing malfunction; Auxiliary devices, e.g. means for testing ([control means F24J 2/40](#))}
- 2/4609 . . . {Protective covers, lids; closure members ([F24J 2/50 takes precedence](#))}
- 2/461 . . . {Means for cleaning or for removing snow}
- 2/4612 . . . {Means for preventing corrosion or protecting against contaminants, e.g. preventing condensations}
- 2/4614 {for draining rain water}
- 2/4616 {for maintaining vacuum, e.g. by using getters}
- 2/4618 {for preventing condensation}
- 2/462 {for deaerating or degassing the working fluid}
- 2/4621 . . . {Means for overtemperature protection ([arrangements for draining the working fluid: F24J 2/4634](#)); Means for overpressure protection}
- 2/4623 {Arrangements for modifying heat collecting features, e.g. by defocusing or by changing the position of heat receiving elements}
- 2/4625 {Cooling arrangements, e.g. by using external heat dissipating means or internal cooling circuits ([F24J 2/4627 takes precedence](#))}
- 2/4627 {Arrangements for venting solar collector enclosures}
- 2/4629 {Arrangements for preventing overpressure inside solar collector enclosures ([F24J 2/4627 takes precedence](#))}
- 2/463 {Arrangements for preventing overpressure inside solar collector circuits}
- 2/4632 . . . {Means for freezing protection ([arrangements for draining the working fluid: F24J 2/4634](#))}
- 2/4634 . . . {Arrangements for draining the working fluid}
- 2/4636 . . . {Arrangements to accommodate differential expansion of solar collector elements}
- 2/4638 . . . {Arrangements for protecting solar collectors against adverse weather conditions ([F24J 2/4609 takes precedence](#))}
- 2/464 . . {Casings}
- 2/4641 . . . {characterised by using specific material}
- 2/4643 {Plastic materials}
- 2/4645 {Metallic materials}
- 2/4647 . . {Means for fluidically interconnecting different solar collectors or for connecting solar connectors with other components; Headers; Fluid distributing means}
- 2/4649 . . {Selection of particular working medium ([materials for heat transfer C09K 5/00](#))}
- 2/465 . . {Arrangements of sealing means}
- 2/4652 . . {Solar heat collectors having absorber surfaces provided with special coatings, e.g. anti-reflective coatings}
- 2/4654 . . {Materials for the heat-exchange conduits ([F24J 2/201](#), [F24J 2/243](#), [F24J 2/48 takes precedence](#))}
- 2002/4656 . . {Arrangements for reinforcement of solar collector elements}
- 2002/4658 . . {Fastening; Joining}
- 2002/4659 . . . {by using hook and loop-type fasteners}
- 2002/4661 . . . {by using hooks}
- 2002/4663 . . . {by clamping}
- 2002/4665 . . . {by clipping, e.g. by using snap connectors}
- 2002/4667 . . . {by screwed connection}
- 2002/4669 . . . {by using threaded elements, e.g. stud bolts}
- 2002/467 . . . {by using form-fitting connection means, e.g. tongue and groove}
- 2002/4672 . . . {by using toothed elements}
- 2002/4674 . . . {by deforming the material, e.g. by crimping or clinching}
- 2002/4676 . . . {by bonding, e.g. by using adhesives}
- 2002/4678 . . . {by welding or brazing}
- 2002/4679 . . . {Joining different materials}
- 2002/4681 {Joining glass with non-glass elements}
- 2002/4683 . . {Selection of particular materials}
- 2002/4685 . . . {Ceramics}
- 2002/4687 . . . {Concrete}
- 2002/4689 . . . {Foams}
- 2002/469 . . . {Carbone, e.g. graphite}
- 2002/4692 . . . {Plastics}
- 2002/4694 . . . {Textiles; Fabrics}
- 2002/4696 . . . {Natural materials, e.g. wood}
- 2002/4698 . . . {Recycled materials}
- 2/48 . . characterised by absorber material
- 2/481 . . . {of metallic material ([F24J 2/487 takes precedence](#))}
- 2/482 . . . {of plastic ([F24J 2/488 takes precedence](#))}
- 2/484 . . . {of ceramic; of concrete; of natural stone ([F24J 2/485 takes precedence](#))}
- 2/485 . . . {using absorber coatings ([radiation-absorbing paints C09D 5/32](#))}
- 2/487 {of metallic material}
- 2/488 {of plastic material}
- 2/50 . . Transparent coverings
- 2002/501 . . . {Special shape}
- 2002/502 {in the form of multiple covering elements}
- 2002/503 {in the form of curved covering elements}
- 2/505 . . . {characterised by using specific material}
- 2/506 {plastic material}
- 2/507 . . . {using evacuated elements ([F24J 2/05 takes precedence](#))}
- 2002/508 . . . {Transparent insulation; Convection preventing members}
- 2/51 . . Thermal insulation ([F24J 2/50 takes precedence](#))
- 2/515 . . . {characterised by the material}
- 2/52 . . Arrangement of mountings or supports
- 2/5201 . . . {Stationary supporting structures for solar modules; Load-bearing elements for movable supporting structures}
- 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](#))}

2/5205	. . . . .	{Substantially planar profile assemblies, e.g. grids comprising coplanar profiles or stacked profiles}	2/525	. . . . .	{Ground anchoring means; Foundations for supporting elements; Massive elements for anchoring supporting structures to the ground or to flat horizontal surfaces}
2/5207	. . . . .	{comprising profiles of particular shape having in cross-section first and second module supporting portions for coupling adjacent solar modules}	2/5252	. . . . .	{Connectors for fixing solar modules, or solar module peripheral frames to supporting elements, e.g. to profiled mounting members}
2/5209	. . . . .	{Substantially coplanar profile assemblies comprising longitudinal profiles laterally coupled with transversal profiles}	2/5254	. . . . .	{Solar module side connectors or base connectors}
2/5211	. . . . .	{Solar module peripheral frames}	2/5256	. . . . .	{Clamping or clipping elements}
2002/5213	. . . . .	{Special profiles}	2/5258	. . . . .	{with clamping action by using screw-threaded elements}
2002/5215	. . . . .	{having hollow parts with closed cross-section}	2/526	. . . . .	{Connectors for coupling adjacent supporting elements together, e.g. profile to profile connectors}
2002/5216	. . . . .	{having circular or oval cross-section}	2/5262	. . . . .	{Connectors for coupling adjacent solar modules or solar module peripheral frames together (F24J 2/5252 takes precedence)}
2002/5218	. . . . .	{having a central web, e.g. I-shaped, inverted T- shaped}	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}
2002/522	. . . . .	{U-, C- or O-shaped; Hat profiles}	2/5266	. . .	{adapted for non-rotary movement}
2002/5222	. . . . .	{in the form of corrugated profiles}	2/5267	. . .	{Waterborne solar collectors}
2002/5224	. . . . .	{having curved portions}	2/5269	. . . .	{Moving platforms}
2002/5226	. . . . .	{having undercut grooves}	2/5271	. . .	{Airborne solar collectors, e.g. using inflated structures (F24J 2/0472, F24J 2/5267 take precedence)}
2/5228	. . . .	{comprising plate-like mounting elements, e.g. profiled or corrugated plates; Plate-like module frames (F24J 2/523 takes precedence)}	2002/5273	. . .	{Details; Special support components or methods}
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}	2002/5275	. . . .	{Arrangements for mounting elements inside solar collectors; Spacers inside solar collectors}
2/5232	. . . . .	{Posts coupled with upper profiles}	2002/5277	. . . .	{Foldable support elements}
2/5233	. . . . .	{Profile arrangements, e.g. assemblies of base profiles with vertical or inclined profiles, three-dimensional frameworks (F24J 2/5232 takes precedence)}	2002/5279	. . . .	{Stackable support elements}
2/5235	. . . . .	{comprising bent plates or assemblies of plates}	2002/5281	. . . .	{Methods for installing support elements}
2/5237	. . . . .	{comprising shaped bodies, e.g. molded box-like elements, concrete elements, foamed elements; Massive supporting structures}	2002/5283	. . . .	{Supports with play between elements}
2/5239	. . . . .	{Interconnected assemblies of stands; Stands having first and second module supporting portions for coupling adjacent modules}	2002/5284	. . . .	{Filling or spacing means; Elastic means}
2/5241	. . . .	{comprising elongated non rigid elements, e.g. straps, wires, ropes}	2002/5286	. . . .	{Tensioning means}
2/5243	. . . .	{Fixation means, e.g. connectors or fasteners}	2002/5288	. . . .	{Means for preventing movements, e.g. stops}
2/5245	. . . . .	{Connectors for anchoring solar modules or supporting elements to the ground or to building structures}	2002/529	. . . .	{Means for accommodating irregularities on mounting surface; Tolerance compensation means}
2/5247	. . . . .	{in the form of bent strips or assemblies of strips; Hook-like connectors; Connectors to be mounted between building covering elements}	2002/5292	. . . .	{Ballasting means}
2/5249	. . . . .	{for anchoring to protrusions of buildings, e.g. to corrugations or to standing seams}	2002/5294	. . . .	{Sealing means between support elements and mounting surface}
			2002/5296	. . . .	{Sealing means between support elements, e.g. overlapping arrangements; Gap closing arrangements}
			2002/5298	. . . .	{Means for preventing theft; Locking means}
			2/54	. . .	specially adapted for rotary movement {(F24J 2/5269 takes precedence)}
			2/5403	. . . .	{with only one rotation axis}
			2/5406	. . . .	{with vertical axis}
			2/541	. . . .	{with horizontal axis}
			2/5413	. . . .	{with inclined axis}
			2/5417	. . . .	{with two rotation axis}
			2/542	. . . .	{with vertical primary axis}

- 2/5424 {with horizontal primary axis}
- 2/5427 {with inclined primary axis}
- 2/5431 {with more than two rotation axis or with multiple degrees of freedom}
- 2002/5434 {Special components}
- 2002/5437 {Driving means}
- 2002/5441 {hydraulic or pneumatic}
- 2002/5444 {Coupling means}
- 2002/5448 {Transmissions}
- 2002/5451 {in the form of articulated bars}
- 2002/5455 {in the form of compasses, scissors or parallelograms}
- 2002/5458 {in the form of flexible elements, e.g. belts, chains, ropes}
- 2002/5462 {in the form of gearings or rack-and-pinion transmissions}
- 2002/5465 {in the form of threaded elements}
- 2002/5468 {for moving several solar collectors by common transmission elements}
- 2002/5472 {for deriving one movement from another one, e.g. for deriving elevation movement from azimuth movement}
- 2002/5475 {Movement guiding means}
- 2002/5479 {Tracks}
- 2002/5482 {Bearings}
- 2002/5486 {Hinged elements; Pin connections}
- 2002/5489 {Spherical joints}
- 2002/5493 {Load balancing means, e.g. use of counter-weights}
- 2002/5496 {Movement dampening means; Braking means}

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

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

2200/00 Prediction; Simulation

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