CPC - COOPERATIVE PATENT CLASSIFICATION

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

ENGINEERING IN GENERAL

F17  STORING OR DISTRIBUTING GASES OR LIQUIDS

F17C  VESSELS FOR CONTAINING OR STORING COMPRESSED, LIQUEFIED OR SOLIDIFIED GASES; FIXED-CAPACITY GAS-HOLDERS; FILLING VESSELS WITH, OR DISCHARGING FROM VESSELS, COMPRESSED, LIQUEFIED, OR SOLIDIFIED GASES (storing fluids in natural or artificial cavities or chambers in the earth
B65G 5/00; construction or assembling of bulk storage containers employing civil-engineering techniques E04H 7/00; variable-capacity gas-holders F17B; liquefaction or refrigeration machines, plants, or systems F25)

WARNING
In this subclass non-limiting references (in the sense of paragraph 39 of the Guide to the IPC) may still be displayed in the scheme.

1/00  Pressure vessels, e.g. gas cylinder, gas tank, replaceable cartridge (pressurised apparatus for purposes other than storage, see the relevant subclasses such as A62C, B05B; associated with vehicles, see the appropriate subclass of classes B60 - B64; pressure vessels in general F16J 12/00; autoclaves B01J 3/04; tank vehicles B60P 3/22; railway tank wagons for carrying fluent materials B61D 5/00; accumulators for supplying fluid under pressure F15B 1/04; liquefied gas stoves F24C 3/00))

1/002  . (Storage in barges or on ships)
1/005  . (Storage of gas or gaseous mixture at high pressure and at high density condition, e.g. in the single state phase)
1/007  . (Underground or underwater storage)
1/02  . involving reinforcing arrangements (F17C 1/14, F17C 1/16 take precedence)
1/04  . Protecting sheathings
1/06  . . . built-up from wound-on bands or filamentary material, e.g. wires
1/08  . . . Integral reinforcements, e.g. ribs
1/10  . with provision for protection against corrosion, e.g. due to gaseous acid (F17C 1/14, F17C 1/16 take precedence); inhibiting corrosion of metallic material or incrustation in general C23F)
1/12  . with provision for thermal insulation (F17C 1/14, F17C 1/16 take precedence); thermal insulation in general F16L 59/00)
1/14  . constructed of aluminium; constructed of non-magnetic steel
1/16  . constructed of plastics materials (shaping of plastics B29C)

3/00  Vessels not under pressure
3/005  . (Underground or underwater containers or vessels (storing in natural or artificial cavities in the earth in general B65G 5/00))
Methods and apparatus for filling vessels not under pressure with liquefied or solidified gases

9/00 Use of gas-solvents or gas-sorbents in vessels

11/00 Details of vessels or of the filling or discharging of vessels

13/00 Vessel construction, in particular geometry, arrangement or size

2201/00 Reinforcing or suspension means

2203/00 Vessel construction, in particular walls or details thereof
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2203/012</td>
<td>. . . on or in the wall, e.g. ribs</td>
</tr>
<tr>
<td>2203/013</td>
<td>. . . in the vessel, e.g. columns</td>
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<tr>
<td>2203/014</td>
<td>. Suspension means</td>
</tr>
<tr>
<td>2203/015</td>
<td>. Bars</td>
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<td>2203/016</td>
<td>. Cords</td>
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<tr>
<td>2203/017</td>
<td>. Magnetic means</td>
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<tr>
<td>2203/018</td>
<td>. by attachment at the neck</td>
</tr>
<tr>
<td>2203/020</td>
<td>. Thermal insulations</td>
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<tr>
<td>2203/021</td>
<td>. by solid means</td>
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<tr>
<td>2203/022</td>
<td>. Radiation shield</td>
</tr>
<tr>
<td>2203/023</td>
<td>. cooled by external means</td>
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<tr>
<td>2203/024</td>
<td>. cooled by vapourised gas from the interior</td>
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<tr>
<td>2203/025</td>
<td>. Multi-sheet layers</td>
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<tr>
<td>2203/026</td>
<td>. Aerogel</td>
</tr>
<tr>
<td>2203/027</td>
<td>. Foam</td>
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<tr>
<td>2203/028</td>
<td>. Polyurethane</td>
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<tr>
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<td>. Granular</td>
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<tr>
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<td>. Perlite</td>
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<tr>
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<td>. Fibres</td>
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<tr>
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<td>. Glass wool</td>
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<tr>
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<td>. Wood</td>
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<tr>
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<td>. in form of panels</td>
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<tr>
<td>2203/036</td>
<td>. by liquid means</td>
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<tr>
<td>2203/037</td>
<td>. Cryogen</td>
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<tr>
<td>2203/038</td>
<td>. Water</td>
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<tr>
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<td>. by gas</td>
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<tr>
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<tr>
<td>2203/042</td>
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<td>. by vacuum</td>
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<td>. Getter</td>
</tr>
<tr>
<td>2203/045</td>
<td>. Materials for walls or layers thereof; Properties or structures of walls or their materials</td>
</tr>
<tr>
<td>2203/046</td>
<td>. Wall structures; Special features thereof</td>
</tr>
<tr>
<td>2203/047</td>
<td>. Liners</td>
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<tr>
<td>2203/048</td>
<td>. Coatings</td>
</tr>
<tr>
<td>2203/049</td>
<td>. Straps, bands or ribbons</td>
</tr>
<tr>
<td>2203/050</td>
<td>. Wall structures</td>
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<tr>
<td>2203/051</td>
<td>. Single wall</td>
</tr>
<tr>
<td>2203/052</td>
<td>. with one layer</td>
</tr>
<tr>
<td>2203/053</td>
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<tr>
<td>2203/054</td>
<td>. with three layers</td>
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<tr>
<td>2203/055</td>
<td>. with four or more layers</td>
</tr>
<tr>
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<td>. Multiple walls</td>
</tr>
<tr>
<td>2203/057</td>
<td>. Two walls</td>
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<tr>
<td>2203/058</td>
<td>. Three or more walls</td>
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<tr>
<td>2203/059</td>
<td>. Materials for walls or layers thereof</td>
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<tr>
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<td>. Non-magnetic steels</td>
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<tr>
<td>2203/063</td>
<td>. Stainless steels</td>
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<tr>
<td>2203/064</td>
<td>. Aluminium</td>
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<td>2203/065</td>
<td>. Alloys or compositions of metals</td>
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<tr>
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<td>. Lead</td>
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<td>. in form of filaments</td>
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<tr>
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<td>. Synthetics</td>
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<tr>
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<td>. Plastics</td>
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<tr>
<td>2203/071</td>
<td>. in form of fibers or filaments</td>
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<tr>
<td>2203/072</td>
<td>. radially wound</td>
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<tr>
<td>2203/073</td>
<td>. axially wound</td>
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</table>

Vessel construction, in particular mounting arrangements, attachments or identifications means

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>2203/074</td>
<td>. Mounting arrangements</td>
</tr>
<tr>
<td>2203/075</td>
<td>. Exterior arrangements</td>
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<tr>
<td>2203/076</td>
<td>. Frames</td>
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<tr>
<td>2203/077</td>
<td>. Boxes</td>
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<tr>
<td>2203/078</td>
<td>. Dismountable protective hulls</td>
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<tr>
<td>2203/079</td>
<td>. Vessel walls form part of another structure</td>
</tr>
<tr>
<td>2203/080</td>
<td>. characterised by number of vessels</td>
</tr>
<tr>
<td>2203/081</td>
<td>. One vessel</td>
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<tr>
<td>2203/082</td>
<td>. Two or more vessels</td>
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<tr>
<td>2203/083</td>
<td>. characterised by the presence of fluid connection between vessels</td>
</tr>
<tr>
<td>2203/084</td>
<td>. bundled in series</td>
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<tr>
<td>2203/085</td>
<td>. bundled in parallel</td>
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<tr>
<td>2203/086</td>
<td>. with details of the manifold</td>
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<tr>
<td>2203/087</td>
<td>. Vessel mounted inside another one</td>
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<tr>
<td>2203/088</td>
<td>. Details of mounting arrangements</td>
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<tr>
<td>2203/089</td>
<td>. for transport</td>
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<tr>
<td>2203/090</td>
<td>. with wheels</td>
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<td>2203/091</td>
<td>. with handgrip</td>
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<tr>
<td>2203/092</td>
<td>. stackable</td>
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<tr>
<td>2203/093</td>
<td>. lockable</td>
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<tr>
<td>2203/094</td>
<td>. with ventilation</td>
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<tr>
<td>2203/095</td>
<td>. Supporting feet</td>
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<tr>
<td>2203/096</td>
<td>. Attachments to the ground, e.g. mooring or anchoring</td>
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<tr>
<td>2203/097</td>
<td>. Hanging up devices</td>
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<tr>
<td>2203/098</td>
<td>. with external bearing means</td>
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<tr>
<td>2203/099</td>
<td>. with shock absorbing means</td>
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<tr>
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<td>. Fluid connections, filters, valves, closure means or other attachments</td>
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<td>. Fittings, valves, filters, or components in connection with the gas storage device</td>
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<tr>
<td>2203/102</td>
<td>. Bosses, e.g. boss collars</td>
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<tr>
<td>2203/103</td>
<td>. Protective caps</td>
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<tr>
<td>2203/104</td>
<td>. Closure means</td>
</tr>
<tr>
<td>2203/105</td>
<td>. breakable, e.g. with burst discs</td>
</tr>
<tr>
<td>2203/106</td>
<td>. fusing or melting</td>
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<tr>
<td>2203/107</td>
<td>. pierceable</td>
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<td>2203/108</td>
<td>. Valves</td>
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<td>. manually actuated</td>
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<tr>
<td>2203/111</td>
<td>. Safety valves or pressure relief valves</td>
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<tr>
<td>2203/112</td>
<td>. Check-valves or non-return valves</td>
</tr>
<tr>
<td>2203/113</td>
<td>. Pressure regulators</td>
</tr>
<tr>
<td>2203/114</td>
<td>. Filters</td>
</tr>
<tr>
<td>2203/115</td>
<td>. Sinter type</td>
</tr>
</tbody>
</table>
Fluid contained in the vessel: Filling and discharging the fluid

223/00 Handled fluid before transfer, i.e. state of fluid when stored in the vessel or before transfer from the vessel

223/01 characterised by the phase
223/0107 Single phase
223/0115 dense or supercritical, i.e. at high pressure and high density
223/0123 gaseous, e.g. CNG, GNC
223/013 liquid
223/0138 solid
223/0146 Two-phase
223/0153 liquefied gas, e.g. LPG, GPL
223/0161 cryogenic, e.g. LNG, GNL, PLNG
223/0169 subcooled
223/0176 Solids and gas
223/0184 Liquids and solids
223/0192 Three-phase, e.g. CO₂ at triple point
223/03 characterised by the pressure level
223/0311 Not under pressure, i.e. containing liquids or solids only
223/033 Small pressure, e.g. for liquefied gas
223/035 High pressure (>10 bar)
223/036 Very high pressure (>80 bar)
223/038 Subatmospheric pressure
223/04 characterised by other properties of handled fluid before transfer
223/041 Stratification
223/042 Localisation of the removal point
223/043 in the gas
223/044 with a dip tube
223/046 in the liquid
223/047 with a dip tube
223/048 in the solid

225/00 Handled fluid after transfer, i.e. state of fluid after transfer from the vessel

225/01 characterised by the phase
225/0107 Single phase
225/0115 dense or supercritical, i.e. at high pressure and high density
225/0123 gaseous, e.g. CNG, GNC
225/013 liquid
225/0138 solid
225/0146 Two-phase
225/0153 liquefied gas, e.g. LPG, GPL
225/0153 cryogenic, e.g. LNG, GNL, PLNG

221/00 Handled fluid, in particular type of fluid

221/01 Pure fluids
221/011 Oxygen
221/012 Hydrogen
221/013 Carbon dioxide
221/014 Nitrogen
221/015 Carbon monoxide
221/016 Noble gases (Ar, Kr, Xe)
221/017 Helium
221/018 Acetylene
221/03 Mixtures
221/031 Air
221/032 Hydrocarbons
221/033 Methane, e.g. natural gas, CNG, LNG, GNL, GNC, PLNG
221/035 Propane butane, e.g. LPG, GPL
221/036 Hydrates
221/037 Containing pollutant, e.g. H₂S, Cl
221/038 Refrigerants
221/05 Ultrapure fluid
221/07 Hyperpolarised gases
221/08 Ergols, e.g. hydrazine
Fluid contained in the vessel; Filling and discharging the fluid

2227/0344 . . . Subcooled
2227/0341 . . . Solids and gas
2227/0339 . . . Liquids and solids
2227/0334 . . . Three-phase, e.g. CO₂ at triple point
2227/0330 . . . characterised by the pressure level
2227/0327 . . . Not under pressure, i.e. containing liquids or solids only
2227/0325 . . . Small pressure, e.g. for liquefied gas
2227/0323 . . . High pressure, i.e. between 10 and 80 bars
2227/0321 . . . Very high pressure, i.e. above 80 bars
2227/0318 . . . Subatmospheric pressure
2227/0313 . . . characterised by other properties of handled fluid after transfer
2227/0311 . . . Stratification
2227/0309 . . . Localisation of the filling point
2227/0306 . . . in the gas
2227/0304 . . . at several points, e.g. with a device for recondensing gas
2227/0302 . . . with a dip tube
2227/0300 . . . in the liquid
2227/0298 . . . with a dip tube
2227/0296 . . . in the solid

2227/00 Transfer of fluids, i.e. method or means for transferring the fluid; Heat exchange with the fluid

2227/01 . . . Propulsion of the fluid
2227/0107 . . . by pressurising the ullage
2227/0114 . . . with vacuum injectors, e.g. venturi
2227/0121 . . . by gravity
2227/0128 . . . with pumps or compressors
2227/0135 . . . Pumps
2227/0142 . . . with specified pump type, e.g. piston or impulsive type
2227/015 . . . with cooling of the pump
2227/0157 . . . Compressors
2227/0164 . . . with specified compressor type, e.g. piston or impulsive type
2227/0171 . . . Arrangement
2227/0178 . . . in the vessel
2227/0185 . . . comprising several pumps or compressors
2227/0192 . . . by using a working fluid
2227/03 . . . Heat exchange with the fluid
2227/0302 . . . by heating
2227/0304 . . . using an electric heater
2227/0306 . . . using the same fluid
2227/0309 . . . using another fluid
2227/0311 . . . Air heating
2227/0313 . . . by forced circulation, e.g. using a fan
2227/0316 . . . Water heating
2227/0318 . . . using seawater
2227/032 . . . using geothermal water
2227/0323 . . . in a closed loop
2227/0325 . . . by expansion using "Joule-Thompson" effect
2227/0327 . . . with recovery of heat
2227/033 . . . using solar energy
2227/0332 . . . by burning a combustible
2227/0334 . . . by radiation means
2227/0337 . . . by cooling
2227/0339 . . . using the same fluid
2227/0341 . . . using another fluid
2227/0344 . . . Air cooling

2227/0346 . . . by forced circulation, e.g. using a fan
2227/0348 . . . Water cooling
2227/0351 . . . using seawater
2227/0353 . . . using cryocooler
2227/0355 . . . in a closed loop
2227/0358 . . . by expansion
2227/036 . . . "Joule-Thompson" effect
2227/0362 . . . in a turbine
2227/0365 . . . with recovery of heat
2227/0367 . . . Localisation of heat exchange
2227/0369 . . . in or on a vessel
2227/0372 . . . in the gas
2227/0374 . . . in the liquid
2227/0376 . . . in wall contact
2227/0379 . . . inside the vessel
2227/0381 . . . integrated in the wall
2227/0383 . . . outside the vessel
2227/0386 . . . with a jacket
2227/0388 . . . separate
2227/039 . . . on the pipes
2227/0393 . . . using a vapouriser
2227/0395 . . . using a submersed heat exchanger
2227/0397 . . . characterised by fins
2227/04 . . . Methods for emptying or filling
2227/041 . . . vessel by vessel
2227/042 . . . with change-over from one vessel to another
2227/043 . . . by pressure cascade
2227/044 . . . by purging
2227/045 . . . by vacuum
2227/046 . . . by even emptying or filling
2227/047 . . . by repeating a process cycle
2227/048 . . . by maintaining residual pressure

2250/00 Accessories; Control means; Indicating, measuring or monitoring of parameters

2250/01 . . . Intermediate tanks
2250/03 . . . Control means
2250/032 . . . using computers
2250/034 . . . using wireless transmissions
2250/036 . . . using alarms
2250/038 . . . using cameras
2250/04 . . . Indicating or measuring of parameters as input values
2250/0404 . . . Parameters indicated or measured
2250/0408 . . . Level of content in the vessel
2250/0413 . . . with floats
2250/0417 . . . with electrical means
2250/0421 . . . Mass or weight of the content of the vessel
2250/0426 . . . Volume
2250/043 . . . Pressure
2250/0434 . . . Pressure difference
2250/0439 . . . Temperature
2250/0443 . . . Flow or movement of content
2250/0447 . . . Composition; Humidity
2250/0452 . . . Concentration of a product
2250/0456 . . . Calorific or heating value
2250/046 . . . Humidity
2250/0465 . . . Vibrations, e.g. of acoustic type
2250/0469 . . . Constraints, e.g. by gauges
2250/0473 . . . Time or time periods
2250/0478 . . . Position or presence
2250/0482 . . . Acceleration
Purposes of gas storage and gas handling

- Improving mechanical properties or manufacturing
- Reducing weight
- Improving strength
- Reducing corrosion
- Enhancing energy recovery
- Refurbishing
- Improving chemical properties
- Reducing risk of explosion
- Improving fluid characteristics

Applications

- Fluid transport or storage
- on or in the water
- Ships
- Wall panels
- Barges
- Platforms
- Terminals
- Offshore
- Storage in depth
- Submarines
- placed above the ground
- Terminals
- Fuel stations
- placed underground
- Type of cavity
- by burying vessels
- by digging cavities
- Salt caverns
- by using natural cavities
- Location of cavity
- offshore
- onshore

Dealing with losses

- Avoiding overpressurising
- Avoiding overfilling
- Avoiding overheating
- Improving metering
- Reducing transfer time
- by calculation
- Making transfer independent of vessel orientation
- Avoiding unauthorised transfer
- Dealing with losses
- due to heat transfer
- Avoiding freezing or defrosting
- by enhancing insulation
- of fluid
- Avoiding leaks
- Handling leaked fluid
- Detecting leaked fluid
- Reducing risks and environmental impact
- Reducing risk of explosion
- Avoiding pollution or contamination

Methods for controlling or regulating parameters

- Indicating or measuring characterised by the location
- Parameters measured at or inside the vessel
- the indicated parameter is a converted measured parameter
- Controlling or regulating of parameters as output values
- Level of content in the vessel
- Mass or weight of the content of the vessel
- Volume
- Pressure
- Temperature
- Flow or movement of content
- Composition; Humidity
- Concentration of a product
- Calorific or heating value
- Humidity
- Vibrations, e.g. of acoustic type
- Constraints, e.g. by gauges
- Time or time periods
- Position or presence
- Acceleration
- Methods for controlling or regulating
- with calculations
- Actions triggered by measured parameters
- Action when predefined value is reached
- when full
- when empty

Effects achieved by gas storage or gas handling

- Purifying the fluid
- by filtering
- by separating
- different phases of a same fluid
- Mixing fluids
- identical fluid
- different fluids
- with odorizing
- Treating the boil-off
- by discharge
- by recovery
- with cooling
- with condensing the gas phase
- with subcooling the liquid phase
- with heating
- with pressurising
- with expanding
- using an independent energy source, e.g. battery
- Regasification
- Fluid distribution
- for supply of supplying vehicles
- for supply of refueling stations
- for refueling vehicle fuel tanks
- for feeding engines for propulsion
- Distribution pipeline networks
- Generating electrical power as side effect

Actions triggered by measured parameters

- accelerating
- time or time periods
- Constraints, e.g. by gauges
- Vibrations, e.g. of acoustic type
- Parameters measured at or inside the vessel
- Measured parameter
- the specified parameter is a converted parameter
- Parameters measured at or inside the vessel
- Measured parameter
- the indicated parameter is a converted measured parameter

Generating electrical power as side effect

- generating electrical power as side effect
Purposes or effects

2270/0165 . . on the road
2270/0168 . . by vehicles
2270/0171 . . Trucks
2270/0173 . . Railways
2270/0176 . . Buses
2270/0178 . . Cars
2270/0181 . . Airbags
2270/0184 . . Fuel cells
2270/0186 . . in the air or in space
2270/0189 . . Planes
2270/0192 . . Hot air balloons
2270/0194 . . for use under microgravity conditions, e.g. space
2270/0197 . . Rockets
2270/02 . for medical applications
2270/025 . . Breathing
2270/05 . for industrial use
2270/0509 . . "Dewar" vessels
2270/0518 . . Semiconductors
2270/0527 . . Superconductors
2270/0536 . . Magnetic resonance imaging
2270/0545 . . Tools
2270/0554 . . Hydraulic applications
2270/0563 . . Pneumatic applications
2270/0572 . . Isostatic presses
2270/0581 . . Power plants
2270/059 . . Mass bottling, e.g. merry belts
2270/07 . for household use
2270/0709 . . Camping gas
2270/0718 . . Aerosols
2270/0727 . . Thermos flasks
2270/0736 . . Capsules, e.g. CO₂
2270/0745 . . Gas bottles
2270/0754 . . Fire extinguishers
2270/0763 . . Fuel cells
2270/0772 . . Inflation devices, e.g. for rescue vests or tyres
2270/0781 . . Diving equipments
2270/079 . . Respiration devices for rescuing