CPC  COOPERATIVE PATENT CLASSIFICATION

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

ENGINES OR PUMPS

F01  MACHINES OR ENGINES IN GENERAL; ENGINE PLANTS IN GENERAL; STEAM ENGINES

F01L  CYCLICALLY OPERATING VALVES FOR MACHINES OR ENGINES (valves in general F16K)

NOTES
1. Groups F01L 1/00 - F01L 3/00 cover only valve-gear or valve arrangements without provision for variable fluid distribution.
2. Valve gear or valve arrangements specially adapted for steam engines are covered by groups F01L 15/00 - F01L 35/00.
3. Valve-gear arrangements specially adapted for machines or engines with variable working-fluid distribution are covered by groups F01L 15/00 - F01L 35/00.
4. Attention is drawn to the notes preceding class F01, especially Note (3).
5. As regards the above-mentioned Note (3), attention is drawn to F01B 3/10, F01B 15/06, F01C 21/18, F02B 53/06, F03C 1/08, F04B 1/18, F04B 7/00, F04B 39/08, F04B 39/10, and F04C 15/06, F04C 29/12.

WARNINGS
1. The following IPC groups are not in the CPC scheme. The subject matter for these IPC groups is classified in the following CPC groups:
   - F01L 31/20 covered by F01L 31/08 - F01L 31/18
   - F01L 31/22 covered by F01L 31/08 - F01L 31/18
   - F01L 31/24 covered by F01L 31/08 - F01L 31/18
2. 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.

Valve-gear for internal combustion piston engines or for other machines or engines with positive working-fluid displacement (valve gear specially for steam engines or specially for other machines or engines with variable fluid distribution F01L 15/00 - F01L 35/00)

1/00  Valve-gear or valve arrangements, e.g. lift-valve gear (lift-valve and valve-seat assemblies per se F01L 3/00; slide-valve gear F01L 5/00); actuated non-mechanically F01L 9/00; valve arrangements in working piston or piston rod F01L 11/00; modifications of valve-gear to facilitate reversing, braking, starting, changing compression ratio, or other specific operations F01L 13/00)

1/02  . Valve drive (transmitting-gear between valve drive and valve F01L 1/12)
1/022  . {Chain drive}
1/024  . {Belt drive}
1/026  . {Gear drive}
2001/028  . {Pre-assembled timing arrangement, e.g. located in a cassette}
1/04  . by means of cams, camshafts, cam discs, eccentrics or the like (F01L 1/10 takes precedence)
1/042  . {Cam discs}
1/044  . {Reciprocating cams}
1/047  . Camshafts
2001/0471  . . . . {Assembled camshafts}

2001/0473  . . . . [Composite camshafts, e.g. with cams or cam sleeve being able to move relative to the inner camshaft or a cam adjusting rod]
2001/0475  . . . . [Hollow camshafts (F01L 2001/0473 takes precedence)]
2001/0476  . . . . [Camshaft bearings]
2001/0478  . . . . [Torque pulse compensated camshafts]
1/053  . . . . overhead type
1/0532  . . . . {the cams being directly in contact with the driven valve}
2001/0535  . . . . [Single overhead camshafts [SOHC]]
2001/0537  . . . . [Double overhead camshafts [DOHC]]
2001/054  . . . . [Camshafts in cylinder block]
1/06  . . . . the cams, or the like, rotating at a higher speed than that corresponding to the valve cycle, e.g. operating four-stroke engine valves directly from crankshaft
1/08  . . . . Shape of cams
1/10  . . . . by means of crank-or eccentric-driven rods (F01L 1/044 takes precedence)
1/12  . . . . Transmitting gear between valve drive and valve (simultaneously operating two or more valves F01L 1/26)
1/14  . . . . Tappets {hydraulic tappets for automatically adjusting or compensating clearance F01L 1/24}; Push rods
1/143  . . . . [for use with overhead camshafts]
1/146  . . . . [Push-rods]
1/16  . . . . Silencing impact; Reducing wear
Valve-gear for internal combustion piston engines or for other machines or engines with positive working-fluid...

<table>
<thead>
<tr>
<th>CPC</th>
<th>1/18</th>
<th>Rocking arms or levers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1/181</td>
<td>[Centre pivot rocking arms]</td>
</tr>
<tr>
<td></td>
<td>1/182</td>
<td>{the rocking arm being pivoted about an individual fulcrum, i.e. not about a common shaft}</td>
</tr>
<tr>
<td></td>
<td>1/183</td>
<td>{of the boat type}</td>
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<tr>
<td></td>
<td>1/185</td>
<td>[Overhead end-pivot rocking arms]</td>
</tr>
<tr>
<td>2001/186</td>
<td></td>
<td>[Split rocking arms, e.g. rocker arms having two articulated parts and means for varying the relative position of these parts or for selectively connecting the parts to move in unison]</td>
</tr>
<tr>
<td>2001/187</td>
<td></td>
<td>[Clips, e.g. for retaining rocker arm on pivot]</td>
</tr>
<tr>
<td>2001/188</td>
<td></td>
<td>[Fulcrums at upper surface]</td>
</tr>
<tr>
<td>1/20</td>
<td></td>
<td>Adjusting or compensating clearance</td>
</tr>
<tr>
<td>1/205</td>
<td></td>
<td>by means of shims or the like</td>
</tr>
<tr>
<td>1/22</td>
<td></td>
<td>automatically, e.g. mechanically</td>
</tr>
<tr>
<td>1/24</td>
<td></td>
<td>by fluid means, e.g. hydraulically</td>
</tr>
<tr>
<td>1/2405</td>
<td></td>
<td>{by means of a hydraulic adjusting device located between the cylinder head and rocker arm}</td>
</tr>
<tr>
<td>1/2411</td>
<td></td>
<td>{by means of a hydraulic adjusting device located between the valve stem and rocker arm}</td>
</tr>
<tr>
<td>1/2416</td>
<td></td>
<td>{by means of a hydraulic adjusting device attached to an articulated rocker}</td>
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<tr>
<td>1/2422</td>
<td></td>
<td>{by means or a hydraulic adjusting device located between the push rod and rocker arm}</td>
</tr>
<tr>
<td>2001/2427</td>
<td></td>
<td>{by means of an hydraulic adjusting device located between cam and push rod}</td>
</tr>
<tr>
<td>2001/2433</td>
<td></td>
<td>[Self contained, e.g. sealed hydraulic lash adjusters]</td>
</tr>
<tr>
<td>2001/2438</td>
<td></td>
<td>[with means permitting forced opening of check valve]</td>
</tr>
<tr>
<td>2001/2444</td>
<td></td>
<td>[Details relating to the hydraulic feeding circuit, e.g. lifter oil manifold assembly [LOMA]]</td>
</tr>
<tr>
<td>1/245</td>
<td></td>
<td>Hydraulic tappets</td>
</tr>
<tr>
<td>1/25</td>
<td></td>
<td>between cam and valve stem</td>
</tr>
<tr>
<td>1/252</td>
<td></td>
<td>{for side-valve engines}</td>
</tr>
<tr>
<td>1/255</td>
<td></td>
<td>between cam and rocker arm</td>
</tr>
<tr>
<td>2001/256</td>
<td></td>
<td>{between cam and push rod}</td>
</tr>
<tr>
<td>1/26</td>
<td></td>
<td>characterised by the provision of two or more valves operated simultaneously by same transmitting-gear, peculiar to machines or engines with more than two lift-valves per cylinder (with coaxial valves ( F01L 1/28 ))</td>
</tr>
<tr>
<td></td>
<td>1/262</td>
<td>{with valve stems disposed radially from a centre which is substantially the centre of curvature of the upper wall surface of a combustion chamber ( F01L 1/265 ) takes precedence}</td>
</tr>
<tr>
<td>1/265</td>
<td></td>
<td>{peculiar to machines or engines with three or more intake valves per cylinder}</td>
</tr>
<tr>
<td>1/267</td>
<td></td>
<td>{with means for varying the timing or the lift of the valves}</td>
</tr>
<tr>
<td>1/28</td>
<td></td>
<td>characterised by the provision of coaxial valves; characterised by the provision of valves cooperating with both intake and exhaust ports</td>
</tr>
<tr>
<td>1/285</td>
<td></td>
<td>{Coaxial intake and exhaust valves}</td>
</tr>
<tr>
<td>1/30</td>
<td></td>
<td>characterised by the provision of positively opened and closed valves, i.e. desmodromic valves</td>
</tr>
<tr>
<td>1/32</td>
<td></td>
<td>characterised by the provision of means for rotating lift valves, e.g. to diminish wear</td>
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</table>

<table>
<thead>
<tr>
<th>CPC</th>
<th>1/34</th>
<th>characterised by the provision of means for changing the timing of the valves without changing the duration of opening {and without affecting the magnitude of the valve lift}</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>1/344</td>
<td>changing the angular relationship between crankshaft and camshaft, e.g. using helicoidal gear</td>
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<td></td>
<td>1/34403</td>
<td>{using helically toothed sleeve or gear moving axially between crankshaft and camshaft}</td>
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<tr>
<td></td>
<td>1/34406</td>
<td>{the helically toothed sleeve being located in the camshaft driving pulley}</td>
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<td></td>
<td>1/34409</td>
<td>{by torque-responsive means}</td>
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<td></td>
<td>1/34413</td>
<td>{using composite camshafts, e.g. with cams being able to move relative to the camshaft}</td>
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<td></td>
<td>1/34416</td>
<td>{using twisted cams}</td>
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<td></td>
<td>1/3442</td>
<td>{using hydraulic chambers with variable volume to transmit the rotating force}</td>
</tr>
<tr>
<td>2001/34423</td>
<td></td>
<td>[Details relating to the hydraulic feeding circuit]</td>
</tr>
<tr>
<td></td>
<td>2001/34426</td>
<td>{Oil control valves}</td>
</tr>
<tr>
<td></td>
<td>2001/3443</td>
<td>{Solenoid driven oil control valves}</td>
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<tr>
<td></td>
<td>2001/34433</td>
<td>{Location oil control valves}</td>
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<td></td>
<td>2001/34436</td>
<td>{Features or method for avoiding malfunction due to foreign matters in oil}</td>
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<tr>
<td></td>
<td>2001/3444</td>
<td>{Oil filters}</td>
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<td>2001/34443</td>
<td>{Cleaning control of oil control valves}</td>
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<td></td>
<td>2001/34446</td>
<td>{Fluid accumulators for the feeding circuit}</td>
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<td></td>
<td>2001/3445</td>
<td>{Details relating to the hydraulic means for changing the angular relationship}</td>
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<td></td>
<td>2001/34453</td>
<td>{Locking means between driving and driven members}</td>
</tr>
<tr>
<td></td>
<td>2001/34456</td>
<td>{Locking in only one position}</td>
</tr>
<tr>
<td></td>
<td>2001/34459</td>
<td>{Locking in multiple positions}</td>
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<tr>
<td></td>
<td>2001/34463</td>
<td>{Locking position intermediate between most retarded and most advanced positions}</td>
</tr>
<tr>
<td></td>
<td>2001/34466</td>
<td>{with multiple locking devices}</td>
</tr>
<tr>
<td></td>
<td>2001/34469</td>
<td>{Lock movement parallel to camshaft axis}</td>
</tr>
<tr>
<td></td>
<td>2001/34473</td>
<td>{Lock movement perpendicular to camshaft axis}</td>
</tr>
<tr>
<td></td>
<td>2001/34476</td>
<td>{Restrict range locking means}</td>
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<tr>
<td></td>
<td>2001/34479</td>
<td>{Sealing of phaser devices}</td>
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<td></td>
<td>2001/34483</td>
<td>{Phaser return springs}</td>
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<tr>
<td></td>
<td>2001/34486</td>
<td>{Location and number of the means for changing the angular relationship}</td>
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<tr>
<td></td>
<td>2001/34489</td>
<td>{Two phasers on one camshaft}</td>
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<tr>
<td></td>
<td>2001/34493</td>
<td>{Dual independent phasing system [DIPS]}</td>
</tr>
<tr>
<td></td>
<td>2001/34496</td>
<td>{Two phasers on different camshafts}</td>
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<tr>
<td></td>
<td>1/348</td>
<td>{by means acting on timing belts or chains}</td>
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<tr>
<td></td>
<td>1/352</td>
<td>{using bevel or epicyclic gear}</td>
</tr>
<tr>
<td></td>
<td>2001/3521</td>
<td>{Harmonic drive of flexpline type}</td>
</tr>
<tr>
<td></td>
<td>2001/3522</td>
<td>{with electromagnetic brake}</td>
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<tr>
<td></td>
<td>1/356</td>
<td>making the angular relationship oscillate {e.g. non-homokinetic drive}</td>
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<tr>
<td></td>
<td>1/36</td>
<td>peculiar to machines or engines of specific type other than four-stroke cycle</td>
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<tr>
<td></td>
<td>1/38</td>
<td>for engines with other than four-stroke cycle, e.g. with two-stroke cycle ( F01L 1/26, F01L 1/28 ) take precedence}</td>
</tr>
</tbody>
</table>
Valve-gear for internal combustion piston engines or for other machines or engines with positive working-fluid...

1/40 . . . for engines with scavenging charge near top dead centre position, e.g. by overlapping inlet and exhaust time (scavenging aspects F02B)
1/42 . . . for machines or engines characterised by cylinder arrangements, e.g. star or fan
1/44 . . . Multiple-valve gear or arrangements, not provided for in preceding subgroups, e.g. with lift and different valves
1/443 . . . (comprising a lift valve and at least one rotary valve)
1/446 . . . (comprising a lift valve and at least one reed valve)
1/46 . . . Component parts, details, or accessories, not provided for in preceding subgroups
1/462 . . . {Valve return spring arrangements}
1/465 . . . {Pneumatic arrangements}
2001/467 . . . {Lost motion springs}

3/00 Lift-valve, i.e. cut-off apparatus with closure members having at least a component of their opening and closing motion perpendicular to the closing faces; Parts or accessories thereof
3/02 . . . Selecting particular materials for valve-members or valve-seats; Valve-members or valve-seats composed of two or more materials
3/04 . . . Coated valve members or valve-seats
3/06 . . . Valve members or valve-seats with means for guiding or deflecting the medium controlled thereby, e.g. producing a rotary motion of the drawn-in cylinder charge (for rotating lift-valves F01L 1/32)
3/08 . . . Valves guides; Sealing of valve stem, e.g. sealing by lubricant
3/085 . . . {Valve cages}
3/10 . . . Connecting springs to valve members
2003/11 . . . (Connecting valve members to rocker arm or tappet)
3/12 . . . Cooling of valves
3/14 . . . by means of a liquid or solid coolant, e.g. sodium, in a closed chamber in a valve
3/16 . . . by means of a fluid flowing through or along valve, e.g. air (for sealing only F01L 3/08)
3/18 . . . Liquid cooling of valve
3/20 . . . Shapes or constructions of valve members, not provided for in preceding subgroups of this group
3/205 . . . {Reed valves}
3/22 . . . Valve-seats not provided for in preceding subgroups of this group; Fixing of valve-seats
3/24 . . . Safety means or accessories, not provided for in preceding sub-groups of this group
2003/25 . . . {Valve configurations in relation to engine}
2003/251 . . . {Large number of valves, e.g. five or more}
2003/253 . . . {configured parallel to piston axis}
2003/255 . . . {configured other than parallel or symmetrical relative to piston axis}
2003/256 . . . {configured other than perpendicular to camshaft axis}
2003/258 . . . {opening away from cylinder}

5/00 Slide valve-gear or valve-arrangements (with pure rotary or oscillatory movement F01L 7/00)
5/02 . . . with other than cylindrical, sleeve or part annularly shaped valves, e.g. with flat-type valves
5/04 . . . with cylindrical, sleeve, or part-annularly shaped valves

5/045 . . . {Piston-type or cylinder-type valves arranged above the piston and coaxial with the cylinder axis}
5/06 . . . surrounding working cylinder or piston
5/08 . . . . Arrangements with several movements or several valves, e.g. one valve inside the other (with part-annularly shaped valves F01L 5/12)
5/10 . . . . with reciprocating and other movements of the same valve
5/12 . . . . Arrangements with part-annularly-shaped valves
5/14 . . . . characterised by the provision of valves with reciprocating and other movements (surrounding working cylinder or piston F01L 5/06)
5/16 . . . . with reciprocating and other movement of same valve, e.g. longitudinally of working cylinder and in cross direction
5/18 . . . . with reciprocatory valve and other slide valve
5/20 . . . . specially for two-stroke engines (F01L 5/06 and F01L 5/14 take precedence)
5/22 . . . . Multiple-valve arrangements (with valves surrounding working cylinder or piston F01L 5/06; with reciprocatory and other slide valves F01L 5/18; specially for two-stroke engines F01L 5/20)
5/24 . . . . Component parts, details or accessories, not provided for in preceding subgroups in this group

7/00 Rotary or oscillatory slide valve-gear or valve arrangements (slide valves with combined rotary and non-rotary movements, combinations of rotary and non-rotary slide valves F01L 5/00)
7/02 . . . with cylindrical, sleeve, or part-annularly shaped valves (of disc type F01L 7/06; of conical type F01L 7/08)
7/021 . . . {with one rotary valve}
7/022 . . . {Cylindrical valves having one recess communicating successively with aligned inlet and exhaust ports}
7/023 . . . {Cylindrical valves having a hollow or partly hollow body allowing axial inlet or exhaust fluid circulation}
7/024 . . . {Cylindrical valves comprising radial inlet and axial outlet or axial inlet and radial outlet}
7/025 . . . {Cylindrical valves comprising radial inlet and side outlet or side inlet and radial outlet}
7/026 . . . {with two or more rotary valves, their rotational axes being parallel, e.g. 4-stroke}
7/027 . . . {with two or more valves arranged coaxially (F01L 7/045 takes precedence)}
7/028 . . . {having the rotational axis coaxial with the cylinder axis and the valve surface not surrounding piston or cylinder}
7/029 . . . {having the rotational axis of the valve parallel to the cylinder axis}
7/04 . . . surrounding working cylinder or piston
7/045 . . . . {with two or more valves arranged coaxially}
7/06 . . . with disc type valves
7/08 . . . with conically or frusto-conically shaped valves
7/10 . . . with valves of other specific shape, e.g. spherical
7/12 . . . specially for two-stroke engines (F01L 7/04 takes precedence)
7/14 . . . Multiple-valve arrangements (with valves surrounding working cylinder or piston F01L 7/04; specially for two-stroke engines F01L 7/12)
7/16 . . . Sealing or packing arrangements specially therefor
Valve-gear for internal combustion piston engines or for other machines or engines with positive working-fluid...

2009/0470...  [Temperature sensors]
2009/0474...  [Flux sensors]
2009/0476...  [Spring force sensors]
2009/0478...  [Electromagnetic actuators; Method of operation thereof]
2009/0477...  [Engine starting]
2009/0482...  [in normal conditions]
2009/0484...  [Cold start]
2009/0486...  [Soft landing, e.g. applying braking current; Levitation of armature close to core surface]
2009/0488...  [Fail safe, e.g. valve kept closed if not opening properly]
2009/049...  [Determination of valve speed]
2009/0492...  [Determination of valve timing during particular working conditions, e.g. deceleration]
2009/0494...  [Engine stopping; Engine stall]
2009/0496...  [relating to sticking duration]
2009/0498...  [relating to gap between armature shaft and valve stem end]

11/00 Valve arrangements in working piston or piston-rod
11/02... in piston
11/04... operated by movement of connecting-rod
11/06... operating oscillatory valve

13/00 Modifications of valve-gear to facilitate reversing, braking, starting, changing compression ratio, or other specific operations
13/0005... [Deactivating valves]
13/0007... [Deactivating cylinders]
13/0015... [for optimising engine performances by modifying valve lift according to various working parameters, e.g. rotational speed, load, torque]
13/0021... [by modification of rocker arm ratio]
13/0026... [by means of an eccentric]
13/0031... [by modification of tappet or pushrod length]
13/0036... [the valves being driven by two or more cams with different shape, size or timing or a single cam profiled in axial and radial direction]
13/0042... [with cams being profiled in axial and radial direction]
13/0047... [the movement of the valves resulting from the sum of the simultaneous actions of at least two cams, the cams being independently variable in phase in respect of each other]
13/0052... [with cams provided on an axially slidable sleeve]
13/0057... [by splittable or deformable cams]
13/0063... [by modification of cam contact point by displacing an intermediate lever or wedge-shaped intermediate element, e.g. Tourtelot]
13/0068... [with an oscillating cam acting on the valve of the "BMW-Valvetronic" type]
13/0073... [with an oscillating cam acting on the valve of the "Delphi" type]
13/0078... [by modification of cam contact point by axially displacing the camshaft]
13/0084... [by modification of cam contact point by radially displacing the camshaft]
13/0089... [with means for delaying valve closing]
13/0094... [with switchable clamp for keeping valve open]
Valve-gear for internal combustion piston engines or for other machines or engines with positive working-fluid...  

13/02 . for reversing
13/04 . for starting by means of fluid pressure
13/06 . for braking
13/065 . . [Compression release engine retarders of the "Jacobs Manufacturing" type]
13/08 . for decompression, e.g. during starting; for changing compression ratio
13/085 . . [the valve-gear having an auxiliary cam protruding from the main cam profile]
2013/10 . . [Auxiliary actuators for variable valve timing]
2013/101 . . [Electromagnets]
2013/103 . . [Electric motors]
2013/105 . . [Hydraulic motors]
2013/106 . . [Pneumatic motors]
2013/108 . . [Centrifugal force]
2013/11 . . . [Sensors for variable valve timing]
2013/111 . . . [Camshafts position or phase]
2013/113 . . . [crankshafts position]
2013/115 . . . [Pressure]
2013/116 . . . [Temperature]
2013/118 . . . [Valve lift]

Valve-gear or valve arrangements, e.g. with reciprocatory slide valves, specially for steam engine, or specially for other machines or engines with variable working-fluid distribution

NOTE

The groups under this guide heading do not fully embrace subject matter restricted to rotary, oscillatory, or lift-valve-gear or valve arrangements, classified in groups F01L 33/00 and F01L 35/00. However, the present groups do embrace the following subject-matter thereof; valves drives or means external to valves for adjustment during operation, tripping-gear, reversing-gear, use of pistons or piston-rods as valves or as valve-supporting elements, valve-gear or valve arrangements peculiar to free-piston machines or engines

15/00 Valve-gear or valve arrangements, e.g. with reciprocatory slide valves, other than provided for in groups F01L 17/00 - F01L 29/00 (valve drive or external valve-adjusment during operation, see the relevant groups, e.g. F01L 31/00; tripping-gear or tripping of valves F01L 31/00)
15/02 . with valves other than cylindrical, sleeve, or part-annularly-shaped, e.g. flat D-valves
15/04 . . . main valve being combined with auxiliary valve (of drag valve type F01L 15/10)
15/06 . . . . [of Meyer or Rider type, i.e. in which the expansion is varied at the expansion valve itself]
15/08 . . . with cylindrical, sleeve, or part-annularly-shaped valves; Such main valves combined with auxiliary valves
15/10 . . . with main slide valve and auxiliary valve dragged thereby
15/12 . . . characterised by having means for effecting pressure equilibrium between two different cylinder spaces at idling
15/14 . . . Arrangements with several co-operating main valves, e.g. reciprocatory and rotary
15/16 . . . with reciprocatory slide valves only
15/18 . . . Valves arrangements not provided for in preceding subgroups of this main group
15/20 . . . Component parts, details, or accessories, not provided for in preceding subgroups of this main group
17/00 Slide valve-gear or valve arrangements with cylindrical, sleeve, or part annularly-shaped valves surrounding working cylinder or piston
17/02 . Drive or adjustment during operation, peculiar thereto, e.g. for reciprocating and oscillating movements or for several valves one inside the other
19/00 Slide valve-gear or valve arrangements with reciprocatory and other movement of same valve, other than provided for in F01L 17/00, e.g. longitudinally of working cylinder and in cross direction
19/02 . Drive or adjustment during operation, peculiar thereto
21/00 Use of working pistons or pistons-rods as fluid-distributing valves or as valve-supporting elements, e.g. in free-piston machines
21/02 . Piston or piston-rod used as valve member (F01L 25/066 takes precedence)
21/04 . Valves arranged in or on piston or piston-rod
23/00 Valves controlled by impact by piston, e.g. in free-piston machines (F01L 25/063 takes precedence)
25/00 Drive, or adjustment during the operation, or distribution or expansion valves by non-mechanical means
25/02 . by fluid means
25/04 . . by working-fluid of machine or engine, e.g. free-piston machine
25/06 . . . Arrangements with main and auxiliary valves, at least one of them being fluid-driven
25/063 . . . . [the auxiliary valve being actuated by the working motor-piston or piston-rod]
25/066 . . . . . [piston or piston-rod being used as auxiliary valve]
25/08 . . . by electric or magnetic means
27/00 Distribution or expansion valve-gear peculiar to free-piston machines or engines and not provided for in F01L 21/00 - F01L 25/00
27/02 . the machine or engine having rotary or oscillatory valves
27/04 . . Delayed-action controls, e.g. of cataract or dashpot type
29/00 Reversing gear (equally usable for control of degree of working-fluid admission and reversing being of secondary-importance F01L 31/00)
29/02 . by displacing eccentric
29/04 . . by links or guide rods
29/06 . . by interchanging inlet and exhaust ports
29/08 . . specially for rotary or oscillatory valves
29/10 . . Details, e.g. drive
29/12 . . . Powered reverse gear
31/00 Valve drive, valve adjustment during operation, or other valve control, not provided for in groups F01L 15/00 - F01L 29/00 (sensing elements measuring the variable or condition to be controlled or regulated F01B)
Valve-gear or valve arrangements, e.g. with reciprocating slide valves, specially for steam engines, or specially for...

2107/00  Preventing the rotation of tappets
2109/00  Self-contained lash adjusters
2105/00  Valve arrangements comprising rollers
2105/02  Mounting of rollers
2103/01  Tools for producing, mounting or adjusting, e.g. some part of the distribution
2103/02  Initial camshaft settings
2103/00  Manufacturing of components used in valve arrangements
2101/02  Using ceramic materials
2101/00  Using particular materials

31/02  . with tripping-gear (for oscillatory valves \(\text{F01L 31/00}\); Tripping of valves
31/04  . . with positively-driven trip levers
31/06  . with tripping-gear specially for oscillatory valves; Oscillating-tripping-valves, e.g. of Corliss type
31/08  . Valve drive or valve adjustment, apart from tripping aspects; Positively-driven gear
31/10  . . the drive being effected by eccentrics (\(\text{F01L 31/14 takes precedence}\)
31/12  . . Valve adjustment by displacing eccentric
31/14  . . Valve adjustment by links or guide rods, e.g. in valve-gears with eccentric drive
31/16  . . the drive being effected by specific means other than eccentric, e.g. cams; Valve adjustment in connection with such drives
31/18  . . specially for rotary or oscillatory valves

Rotary or oscillatory slide valve-gear or lift-valve-gear or such valve arrangements specially for steam engines or specially for other machines or engines with variable working-fluid distribution (drive adjustment during operation, tripping-gear, reversing-gear, use of working pistons or piston-rods as valves or as valves-supporting elements, valve-gear or valve arrangements peculiar to free-piston machines or engines \(\text{F01L 15/00 - F01L 31/00}\))

33/00  Rotary or oscillatory slide valve-gear or valve arrangements, specially adapted for machines or engines with variable fluid distribution (drive, adjustment during operation, tripping-gear, reversing-gear, use of working pistons or piston-rods as valves or as valve-supporting elements, valve-gear or valve arrangements peculiar to free-piston machines or engines \(\text{F01L 15/00 - F01L 31/00}\))
33/02  . rotary
33/04  . oscillatory

35/00  Lift valve-gear or valve arrangements specially adapted for machines or engines with variable fluid distribution (drive, adjustment during operation, tripping-gear, reversing-gear, use of working pistons or piston-rods as valves or as valve-supporting elements, valve-gear or valve arrangements peculiar to free-piston machines or engines \(\text{F01L 15/00 - F01L 31/00}\))
35/02  . Valves
35/04  . Arrangements of valves in the machine or engine, e.g. relative to working cylinder

2111/00  Differential gears located between crankshafts and camshafts for varying the timing of valves
2113/00  Rotary valve drives
2201/00  Electronic control systems; Apparatus or methods therefor
2250/00  Camshaft drives characterised by their transmission means
2250/02  . the camshaft being driven by chains
2250/04  . the camshaft being driven by belts
2250/06  . the camshaft being driven by gear wheels
2710/00  Control of valve gear, speed or power
2710/0003  . Control of valve gear for two stroke engines
2710/0006  . Safety devices therefor
2740/00  Control of slide-valve gear; Control pistons
2740/0003  . more than one slide-valve, e.g. for four stroke engines
2740/0006  . more than one slide-valve, e.g. for two stroke engines
2750/00  Control of valve gear for four stroke engines directly driven by the crankshaft
2760/00  Control of valve gear to facilitate reversing, starting, braking of four stroke engines
2760/0001  . for starting four stroke engines
2760/0002  . for reversing or starting four stroke engines
2760/0003  . for switching to compressor action in order to brake
2760/0004  . . whereby braking is exclusively produced by compression in the cylinders
2760/0005  . . in cooperation with vehicle transmission or brakes; devices to facilitate switching to compressor action by means of other control devices, e.g. acceleration pedal or clutch
2760/0006  . for reversing two stroke engines
2760/0007  . for starting two stroke engines
2760/0008  . for reversing and restarting two stroke engines
2800/00  Methods of operation using a variable valve timing mechanism
2800/01  . Starting
2800/02  . Cold running
2800/03  . Stopping; Stalling
2800/04  . Timing control at idling
2800/05  . Timing control under consideration of oil condition
2800/06  . Timing or lift different for valves of same cylinder
2800/08  . Timing or lift different for valves of different cylinders
2800/09  . Calibrating
2800/10  . Providing exhaust gas recirculation [EGR]
2800/11  . Fault detection, diagnosis
2800/12  . Fail safe operation
2800/13  . Throttleless
2800/14  . Determining a position, e.g. phase or lift
2800/15  . Balancing of rotating parts
2800/16  . Preventing interference
2800/17  . Maintenance; Servicing
2800/18  . Testing or simulation
2800/19  . Valves opening several times per stroke
2810/00  Arrangements solving specific problems in relation with valve gears
2810/01  . Cooling
2810/02  .  Lubrication
2810/03  .  Reducing vibration
2810/04  .  Reducing noise
2810/05  .  Related to pressure difference on both sides of a valve

2820/00  Details on specific features characterising valve gear arrangements
2820/01  .  Absolute values
2820/02  .  Formulas
2820/03  .  Auxiliary actuators
2820/031 .  Electromagnets
2820/032 .  Electric motors
2820/033 .  Hydraulic engines
2820/034 .  Pneumatic engines
2820/035 .  Centrifugal forces
2820/04  .  Sensors
2820/041 .  Camshafts position or phase sensors
2820/042 .  Crankshafts position
2820/043 .  Pressure
2820/044 .  Temperature
2820/045 .  Valve lift