

CPC**COOPERATIVE PATENT CLASSIFICATION****F01L****CYCLICALLY OPERATING VALVES FOR MACHINES OR ENGINES**

(valves in general F16K)

NOTE

1. Groups [F01L 1/00](#) to [F01L 13/00](#) 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](#) to [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](#) to [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 21/12**, [F02B 53/06](#), [F03C 1/08](#), [F04B 1/18](#), [F04B 7/00](#), [F04B 39/08](#), [F04B 39/10](#), and **F04C 15/02**, **F04C 29/08**.

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](#) to [F01L 35/00](#))

F01L 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](#))

- F01L 1/02 . Valve drive (transmitting-gear between valve drive and valve [F01L 1/12](#))
- F01L 1/022 .. { Chain drive}
- F01L 1/024 .. { Belt drive}
- F01L 1/026 .. { Gear drive}
- F01L 1/04 .. by means of cams, camshafts, cam discs, eccentrics or the like ([F01L 1/10](#) takes precedence)
- F01L 1/042 ... {Cam discs}
- F01L 1/044 ... {Reciprocating cams}
- F01L 1/047 ... Camshafts
- F01L 1/053 overhead type
- F01L 1/0532 {the cams being directly in contact with the driven valve}
- F01L 1/06 ... the cams, or the like, rotating at a higher speed than that corresponding to the valve cycle, e.g. operating fourstroke engine valves directly from crankshaft
- F01L 1/08 ... Shape of cams
- F01L 1/10 .. by means of crank-or eccentric-driven rods {([F01L 1/044](#) takes precedence)}
- F01L 1/12 . Transmitting gear between valve drive and valve (simultaneously operating two or more valves [F01L 1/26](#))

- F01L 1/14 .. Tappets **{(hydraulic tappets for automatically adjusting or compensating clearance F01L 1/24B)}**; Push rods
- F01L 1/143 ... {for use with overhead camshafts}
- F01L 1/146 ... {Push-rods}
- F01L 1/16 ... Silencing impact; Reducing wear
- F01L 1/18 .. Rocking arms or levers
- F01L 1/181 ... {Centre pivot rocking arms}
- F01L 1/182 {the rocking arm being pivoted about an individual fulcrum, i.e. not about a common shaft}
- F01L 1/183 {of the boat type}
- F01L 1/185 ... {Overhead end-pivot rocking arms}

- F01L 1/20 . Adjusting or compensating clearance
- F01L 1/205 .. {by means of shims or the like}
- F01L 1/22 .. automatically, e.g. mechanically
- F01L 1/24 ... by fluid means, e.g. hydraulically
- F01L 1/2405 {by means of a hydraulic adjusting device located between the cylinder head and rocker arm}
- F01L 1/2411 {by means of a hydraulic adjusting device located between the valve stem and rocker arm}
- F01L 1/2416 {by means of a hydraulic adjusting device attached to an articulated rocker}
- F01L 1/2422 {by means of a hydraulic adjusting device located between the push rod and rocker arm}
- F01L 1/245 Hydraulic tappets
- F01L 1/25 between cam and valve stem
- F01L 1/252 {for side-valve engines}
- F01L 1/255 between cam and rocker arm

- F01L 1/26 . 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)**
- F01L 1/262 .. {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)**}
- F01L 1/265 .. {peculiar to machines or engines with three or more intake valves per cylinder}
- F01L 1/267 .. {with means for varying the timing or the lift of the valves}

- F01L 1/28 . characterised by the provision of coaxial valves; characterised by the provision of valves co-operating with both intake and exhaust ports
- F01L 1/285 .. {Coaxial intake and exhaust valves}

- F01L 1/30 . characterised by the provision of positively opened and closed valves, i.e. desmodromic valves

- F01L 1/32 . characterised by the provision of means for rotating lift valves, e.g. to diminish wear

- F01L 1/34 . 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}**

- F01L 1/344 . . . changing the angular relationship between crankshaft and camshaft, e.g. using helicoidal gear
- F01L 1/34403 . . . {using helically teathed sleeve or gear moving axially between crankshaft and camshaft}
- F01L 1/34406 . . . {the helically teathed sleeve being located in the camshaft driving pulley}
- F01L 1/34409 . . . {by torque-responsive means}
- F01L 1/34413 . . . {using composite camshafts, e.g. with cams being able to move relative to the camshaft}
- F01L 1/34416 . . . {using twisted cams}
- F01L 1/3442 . . . {using hydraulic chambers with variable volume to transmit the rotating force}
- F01L 1/348 . . . by means acting on timing belts or chains
- F01L 1/352 . . . using bevel or epicyclic gear
- F01L 1/356 . . . making the angular relationship oscillate, {e.g. non-homokinetic drive}

- F01L 1/36 . . . peculiar to machines or engines of specific type other than four-stroke cycle
- F01L 1/38 . . . for engines with other than four-stroke cycle, e.g. with two-stroke cycle ([F01L 1/26](#), [F01L 1/28](#) take precedence)
- F01L 1/40 . . . for engines with scavenging charge near top dead centre position, e.g. by overlapping inlet and exhaust time ([scavenging aspects F02B](#))
- F01L 1/42 . . . for machines or engines characterised by cylinder arrangements, e.g. star or fan

- F01L 1/44 . . . Multiple-valve gear or arrangements, not provided for in preceding subgroups, e.g. with lift and different valves
- F01L 1/443 . . . {comprising a lift valve and at least one rotary valve}
- F01L 1/446 . . . {comprising a lift valve and at least one reed valve}

- F01L 1/46 . . . Component parts, details, or accessories, not provided for in preceding subgroups
- F01L 1/462 . . . {Valve return spring arrangements}
- F01L 1/465 . . . {Pneumatic arrangements}

- F01L 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**

- F01L 3/02 . . . Selecting particular materials for valve-members or valve-seats; Valve-members or valve-seats composed of two or more materials
- F01L 3/04 . . . Coated valve members or valve-seats

- F01L 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](#))

- F01L 3/08 . . . Valves guides; Sealing of valve stem, e.g. sealing by lubricant
- F01L 3/085 . . . {Valve cages}

- F01L 3/10 . . . Connecting springs to valve members

- F01L 3/12 . . . Cooling of valves

- F01L 3/14 . . . by means of a liquid or solid coolant, e.g. sodium, in a closed chamber in a valve
- F01L 3/16 . . . by means of a fluid flowing through or along valve, e.g. air ([for sealing only F01L 3/08](#))
- F01L 3/18 Liquid cooling of valve
- F01L 3/20 . . Shapes or constructions of valve members, not provided for in preceding subgroups of this group
- F01L 3/205 . . . {[Reed valves](#)}
- F01L 3/22 . . Valve-seats not provided for in preceding subgroups of this group; Fixing of valve-seats
- F01L 3/24 . . Safety means or accessories, not provided for in preceding sub- groups of this group
- F01L 5/00** **Slide valve-gear or valve-arrangements** ([with pure rotary or oscillatory movement F01L 7/00](#))
- F01L 5/02 . . with other than cylindrical, sleeve or part annularly shaped valves e.g. with flat-type valves
- F01L 5/04 . . with cylindrical, sleeve, or part-annularly shaped valves
- F01L 5/045 . . . {[Piston-type or cylinder-type valves arranged above the piston and coaxial with the cylinder axis](#)}
- F01L 5/06 . . . surrounding working cylinder or piston
- F01L 5/08 Arrangements with several movements or several valves, e.g. one valve inside the other ([with part-annularly shaped valves F01L 5/12](#))
- F01L 5/10 with reciprocating and other movements of the same valve
- F01L 5/12 Arrangements with part-annularly-shaped valves
- F01L 5/14 . . characterised by the provision of valves with reciprocating and other movements ([surrounding working cylinder or piston F01L 5/06](#))
- F01L 5/16 . . . with reciprocating and other movement of same valve, e.g. longitudinally of working cylinder and in cross direction
- F01L 5/18 . . . with reciprocatory valve and other slide valve
- F01L 5/20 . . specially for two-stroke engines ([F01L 5/06](#) and [F01L 5/14](#) take precedence)
- F01L 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](#))
- F01L 5/24 . . Component parts, details or accessories, not provided for in preceding subgroups in this group
- F01L 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](#))
- F01L 7/02 . . with cylindrical, sleeve, or part-annularly shaped valves ([of disc type F01L 7/06](#); [of conical type F01L 7/08](#))

- F01L 7/021 . . {with one rotary valve}
- F01L 7/022 . . . {Cylindrical valves having one recess communicating successively with aligned inlet and exhaust ports}
- F01L 7/023 . . . {Cylindrical valves having a hollow or partly hollow body allowing axial inlet or exhaust fluid circulation}
- F01L 7/024 . . . {Cylindrical valves comprising radial inlet and axial outlet or axial inlet and radial outlet}
- F01L 7/025 . . . {Cylindrical valves comprising radial inlet and side outlet or side inlet and radial outlet}
- F01L 7/026 . . {with two or more rotary valves, their rotational axes being parallel, e.g. 4-stroke}
- F01L 7/027 . . [N. with two or more valves arranged coaxially ([F01L 7/045](#) takes precedence)]
- F01L 7/028 . . {having the rotational axis coaxial with the cylinder axis and the valve surface not surrounding piston or cylinder}
- F01L 7/029 . . {having the rotational axis of the valve parallel to the cylinder axis}
- F01L 7/04 . . Surrounding working cylinder or piston
- F01L 7/045 . . . {with two or more valves arranged coaxially}

- F01L 7/06 . with disc type valves
- F01L 7/08 . with conically or frusto-conically shaped valves
- F01L 7/10 . with valves of other specific shape, e.g. spherical
- F01L 7/12 . specially for two-stroke engines ([F01L 7/04](#) takes precedence)
- F01L 7/14 . Multiple-valve arrangements (with valves surrounding working cylinder or piston [F01L 7/04](#); specially for two-stroke engines [F01L 7/12](#))
- F01L 7/16 . Sealing or packing arrangements specially therefor
- F01L 7/18 . Component parts, details, or accessories not provided for in preceding sub-groups of this group

- F01L 9/00 Valve-gear or valve arrangements actuated non-mechanically**
- F01L 9/02 . by fluid means, e.g. hydraulic
- F01L 9/021 . . {the action of a cam being transmitted to a valve by a fluid column, e.g. a fluid conduit}
- F01L 9/023 . . . {Hydraulic lifters, i.e. fluid chamber comprised between a piston actuated by a cam and a piston acting on a valve stem}
- F01L 9/025 {the volume of the chamber being variable, e.g. for varying the lift or the timing of a valve}
- F01L 9/026 . . {Pneumatic}
- F01L 9/04 . by electric means

- F01L 11/00 Valve arrangements in working piston or piston-rod**

- F01L 11/02 . in piston
- F01L 11/04 . . operated by movement of connecting-rod
- F01L 11/06 . . . operating oscillatory valve

- F01L 13/00 Modifications of valve-gear to facilitate reversing, braking, starting, changing compression ratio, or other specific operations**

- F01L 13/0005 . {Deactivating valves}

- F01L 13/0015 . {for optimising engine performances by modifying valve lift according to various working parameters, e.g. rotational speed, load, torque}
- F01L 13/0021 . . {by modification of rocker arm ratio}
- F01L 13/0026 . . . {by means of an eccentric}
- F01L 13/0031 . . {by modification of tappet or pushrod length}
- F01L 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}
- F01L 13/0042 . . . {with cams being profiled in axial and radial direction}
- F01L 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}

- F01L 13/0057 . . {by splittable or deformable cams}
- F01L 13/0063 . . {by modification of cam contact point by displacing an intermediate lever or wedge-shaped intermediate element, e.g. Tourtelot}

- F01L 13/02 . for reversing

- F01L 13/04 . for starting by means of fluid pressure

- F01L 13/06 . for braking
- F01L 13/065 . . {Compression release engine retarders of the "Jacobs Manufacturing" type}

- F01L 13/08 . for decompression, e.g. during starting; for changing compression ratio
- F01L 13/085 . . {the valve-gear having an auxiliary cam protruding from the main cam profile}

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

- F01L 15/00** **Valve-gear or valve arrangements, e.g. with reciprocatory slide valves, other than provided for in groups [F01L 17/00](#) to [F01L 29/00](#) (valve drive or external valve-adjustment during operation, see the relevant groups, e.g. [F01L 31/00](#); tripping-gear or tripping of valves [F01L 31/00](#))**
- [F01L 15/02](#) . with valves other than cylindrical, sleeve, or part-annularly-shaped, e.g. flat D-valves
- [F01L 15/04](#) . . main valve being combined with auxiliary valve (of drag valve type [F01L 15/10](#))
- [F01L 15/06](#) . . . of Meyer or Rider type, i.e. in which the expansion is varied at the expansion valve itself
- [F01L 15/08](#) . with cylindrical, sleeve, or part-annularly-shaped valves; Such main valves combined with auxiliary valves
- [F01L 15/10](#) . with main slide valve and auxiliary valve dragged thereby
- [F01L 15/12](#) . characterised by having means for effecting pressure equilibrium between two different cylinder spaces at idling
- [F01L 15/14](#) . Arrangements with several co-operating main valves, e.g. reciprocatory and rotary
- [F01L 15/16](#) . . with reciprocatory slide valves only
- [F01L 15/18](#) . Valves arrangements not provided for in preceding sub-groups of this main group
- [F01L 15/20](#) . Component parts, details, or accessories, not provided for in preceding sub-groups of this main group
- F01L 17/00** **Slide valve-gear or valve arrangements with cylindrical, sleeve, or part annularly-shaped valves surrounding working cylinder or piston**
- [F01L 17/02](#) . Drive or adjustment during operation, peculiar thereto, e.g. for reciprocating and oscillating movements or for several valves one inside the other
- F01L 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**
- [F01L 19/02](#) . Drive or adjustment during operation, peculiar thereto
- F01L 21/00** **Use of working pistons or pistons-rods as fluid-distributing valves or a valve-supporting elements, e.g. in free-piston machines**
- [F01L 21/02](#) . Piston or piston-rod used as valve members {[F01L 25/066](#) takes precedence}
- [F01L 21/04](#) . Valves arranged in or on piston or piston-rod
- F01L 23/00** **Valves controlled by impact by piston, e.g. in free-piston machines; {[F01L 25/063](#) takes precedence}**

| | |
|-------------------|---|
| F01L 25/00 | Drive, or adjustment during the operation, or distribution or expansion valves by non-mechanical means |
| F01L 25/02 | . by fluid means |
| F01L 25/04 | . . by working-fluid of machine or engine, e.g. free-piston machine |
| F01L 25/06 | . . . Arrangement with main and auxiliary valves, at least one of them being fluid-driven |
| F01L 25/063 | {the auxiliary valve being actuated by the working motor-piston or piston-rod} |
| F01L 25/066 | {piston or piston-rod being used as auxiliary valve} |
| F01L 25/08 | . by electric or magnetic means |
| F01L 27/00 | Distribution or expansion valve-gear peculiar to free-piston machines or engines and not provided for in F01L 21/00 to F01L 25/00 |
| F01L 27/02 | . the machine or engine having rotary or oscillatory valves |
| F01L 27/04 | . Delayed-action controls, e.g. of cataract or dashpot type |
| F01L 29/00 | Reversing gear (equally usable for control of degree of working-fluid admission and reversing being of secondary-importance F01L 31/00) |
| F01L 29/02 | . by displacing eccentric |
| F01L 29/04 | . by links or guide rods |
| F01L 29/06 | . by interchanging inlet and exhaust ports |
| F01L 29/08 | . specially for rotary or oscillatory valves |
| F01L 29/10 | . Details, e.g. drive |
| F01L 29/12 | . . Powered reverse gear |
| F01L 31/00 | Valve drive, valve adjustment during operation, or other valve control, not provided for in groups F01L 15/00 to F01L 29/00(sensing elements measuring the variable or condition to be controlled or regulated F01B) |
| F01L 31/02 | . with tripping-gear (for oscillatory valves F01L 31/06); Tripping of valves |
| F01L 31/04 | . . with positively-driven trip levers |
| F01L 31/06 | . with tripping-gear specially for oscillatory valves; Oscillatory tripping-valves, e.g. of Corliss type |
| F01L 31/08 | . Valve drive or valve adjustment, apart from tripping aspects; Positively-driven gear |
| F01L 31/10 | . . the drive being effected by eccentrics (F01L 31/14 takes precedence) |
| F01L 31/12 | . . . Valve adjustment by displacing eccentric |
| F01L 31/14 | . . Valve adjustment by links or guide rods, e.g. in valve-gear with eccentric drive |

- F01L 31/16 . . the drive being effected by specific means other than eccentric, e.g. cams; Valve adjustment in connection with such drives
 - F01L 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 [F01L 15/00](#) to [F01L 31/00](#))
- F01L 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 [F01L 15/00](#) to [F01L 31/00](#))
 - F01L 33/02 . rotary
 - F01L 33/04 . oscillatory
 - F01L 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 [F01L 15/00](#) to [F01L 31/00](#))
 - F01L 35/02 . Valves
 - F01L 35/04 . Arrangements of valves in the machine or engine, e.g. relative to working cylinder
 - F01L 2001/00** **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](#))
 - F01L 2001/02 . Valve drive ([transmitting-gear between valve drive and valve](#) [F01L 1/12](#))
 - F01L 2001/028 . . Pre-assembled timing arrangement, e.g. located in a cassette
 - F01L 2001/04 . . by means of cams, camshafts, cam discs, eccentrics or the like ([F01L 1/10](#) takes precedence)
 - F01L 2001/047 . . . Camshafts
 - F01L 2001/0471 Assembled camshafts, e.g. "gebaute Nockenwelle"
 - F01L 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
 - F01L 2001/0475 Hollow camshafts ([F01L 2001/0473](#) takes precedence)
 - F01L 2001/0476 Camshaft bearings

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|-----------------|-------|--|
| F01L 2001/0478 | | Torque pulse compensated camshafts |
| F01L 2001/053 | | overhead type |
| F01L 2001/0535 | ..... | Single overhead camshafts (SOHC) |
| F01L 2001/0537 | ..... | Double overhead camshafts (DOHC) |
| F01L 2001/054 | .... | Camshafts in cylinder block |
| F01L 2001/12 | . | Transmitting gear between valve drive and valve (simultaneously operating two or more valves F01L 1/26) |
| F01L 2001/18 | .. | Rocking arms or levers |
| F01L 2001/186 | ... | 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 |
| F01L 2001/187 | ... | Clips, e.g. for retaining rocker arm on pivot |
| F01L 2001/188 | ... | Fulcrums at upper surface |
| F01L 2001/20 | . | Adjusting or compensating clearance |
| F01L 2001/22 | .. | automatically, e.g. mechanically |
| F01L 2001/24 | ... | by fluid means, e.g. hydraulically |
| F01L 2001/2427 | .... | by means of an hydraulic adjusting device located between cam and push rod |
| F01L 2001/2433 | .... | Self contained, e.g. sealed hydraulic lash adjusters |
| F01L 2001/2438 | .... | with means permitting forced opening of check valve |
| F01L 2001/2444 | .... | Details relating to the hydraulic feeding circuit, e.g. lifter oil manifold assembly (LOMA) |
| F01L 2001/245 | .... | Hydraulic tappets |
| F01L 2001/256 | ..... | between cam and push rod |
| F01L 2001/34 | . | 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) |
| F01L 2001/344 | .. | changing the angular relationship between crankshaft and camshaft, e.g. using helicoidal gear |
| F01L 2001/3442 | ... | {using hydraulic chambers with variable volume to transmit the rotating force} |
| F01L 2001/34423 | .... | Details relating to the hydraulic feeding circuit |
| F01L 2001/34426 | ..... | Oil control valves |
| F01L 2001/3443 | ..... | Solenoid driven oil control valves |
| F01L 2001/34433 | ..... | Location oil control valves |
| F01L 2001/34436 | ..... | Features or method for avoiding malfunction due to foreign matters in oil |
| F01L 2001/3444 | ..... | Oil filters |
| F01L 2001/34443 | ..... | Cleaning control of oil control valves |
| F01L 2001/34446 | ..... | Fluid accumulators for the feeding circuit |
| F01L 2001/3445 | .... | Details relating to the hydraulic means for changing the angular relationship |
| F01L 2001/34453 | ..... | Locking means between driving and driven members |
| F01L 2001/34456 | ..... | Locking in only one position |
| F01L 2001/34459 | ..... | Locking in multiple positions |
| F01L 2001/34463 | | Locking position intermediate between most retarded and most |

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|---------------------|-------|---|
| | | advanced positions |
| F01L 2001/34466 | | with multiple locking devices |
| F01L 2001/34469 | | Lock movement parallel to camshaft axis |
| F01L 2001/34473 | ..... | Lock movement perpendicular to camshaft axis |
| F01L 2001/34476 | ..... | Restrict range locking means |
| F01L 2001/34479 | ..... | Sealing of phaser devices |
| F01L 2001/34483 | ..... | Phaser return springs |
| F01L 2001/34486 | ... | Location and number of the means for changing the angular relationship |
| F01L 2001/34489 | .... | Two phasers on one camshaft |
| F01L 2001/34493 | .... | Dual independent phasing system (DIPS) |
| F01L 2001/34496 | .... | Two phasers on different camshafts |
| F01L 2001/352 | ... | using bevel or epicyclic gear |
| F01L 2001/3521 | .... | Harmonic drive of flexspline type |
| F01L 2001/3522 | .... | with electromagnetic brake |
| F01L 2001/46 | . | Component parts, details, or accessories, not provided for in preceding subgroups |
| F01L 2001/467 | .. | Lost motion springs |
| F01L 2003/00 | | 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 |
| F01L 2003/11 | . | Connecting valve members to rocker arm or tappet |
| F01L 2003/25 | . | Valve configurations in relation to engine |
| F01L 2003/251 | .. | Large number of valves, e.g. five or more |
| F01L 2003/253 | .. | configured parallel to piston axis |
| F01L 2003/255 | .. | configured other than parallel or symmetrical relative to piston axis |
| F01L 2003/256 | .. | configured other than perpendicular to camshaft axis |
| F01L 2003/258 | .. | opening away from cylinder |
| F01L 2009/00 | | Valve-gear or valve arrangements actuated non-mechanically |
| F01L 2009/02 | . | by fluid means, e.g. hydraulic |
| F01L 2009/028 | .. | Boost means, i.e. means for increasing initial opening force of the valve |
| F01L 2009/04 | . | by electric means |
| F01L 2009/0401 | .. | Driving circuits therefor |
| F01L 2009/0403 | .. | Electromagnetic actuators comprising one coil |
| F01L 2009/0405 | .. | Electromagnetic actuators comprising two or more coils |
| F01L 2009/0407 | ... | The two coils being disposed coaxially to the armature shaft |
| F01L 2009/0409 | ... | The armature being articulated perpendicularly to the coils axes |
| F01L 2009/0411 | .. | Electromagnetic actuators using a rotary motor |
| F01L 2009/0413 | .. | Piezo electric actuators |

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| F01L 2009/0415 | .. | Moving coil actuators |
| F01L 2009/0417 | .. | Floating actuators for varying the valve stroke |
| F01L 2009/0419 | .. | Actuator position setting device, e.g. initial setting |
| F01L 2009/0421 | .. | Mixed arrangement with both mechanically and electromagnetically actuated valves |
| F01L 2009/0423 | .. | Electromagnetic actuators construction details |
| F01L 2009/0425 | ... | Shaft and armature construction |
| F01L 2009/0426 | .... | Arrangements for amplifying the armature stroke |
| F01L 2009/0428 | ... | Core and coil construction |
| F01L 2009/043 | ... | Casing construction |
| F01L 2009/0432 | ... | Biasing means |
| F01L 2009/0434 | .... | Helical springs |
| F01L 2009/0436 | ..... | Two opposed springs for intermediate resting position of the armature |
| F01L 2009/0438 | .... | Torsion springs |
| F01L 2009/044 | .... | Pneumatic springs |
| F01L 2009/0442 | .... | Means for varying the spring bias |
| F01L 2009/0444 | .... | Means for connecting springs to valve or anchor |
| F01L 2009/0446 | ... | Latching means |
| F01L 2009/0448 | .... | using permanent magnet |
| F01L 2009/0449 | ... | Means for varying the air gap |
| F01L 2009/0451 | ... | Damping means |
| F01L 2009/0453 | ... | Means for counteracting cylinder pressure |
| F01L 2009/0455 | ... | Lash adjusting means |
| F01L 2009/0457 | ... | Actor cooling means |
| F01L 2009/0459 | ... | Means for facilitating assembly |
| F01L 2009/0461 | ... | Wiring |
| F01L 2009/0463 | .... | Connectors |
| F01L 2009/0465 | .... | Harnesses |
| F01L 2009/0467 | ... | Sensing means |
| F01L 2009/0469 | .... | Position sensors |
| F01L 2009/0471 | .... | Vibration sensors |
| F01L 2009/0473 | .... | Temperature sensors |
| F01L 2009/0474 | .... | Flux sensors |
| F01L 2009/0476 | .... | Spring force sensors |
| F01L 2009/0478 | .. | Electromagnetic actuators; Method of operation thereof |
| F01L 2009/048 | ... | Engine starting |
| F01L 2009/0482 | .... | in normal conditions |
| F01L 2009/0484 | .... | Cold start |
| F01L 2009/0486 | ... | Soft landing, e.g. applying braking current; Levitation of armature close to core surface |
| F01L 2009/0488 | ... | Fail safe, e.g. valve kept closed if not opening properly |
| F01L 2009/049 | ... | Determination of valve speed |

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| F01L 2009/0492 | ... | Determination of valve timing during particular working conditions, e.g. deceleration |
| F01L 2009/0494 | ... | Engine stopping; Engine stall |
| F01L 2009/0496 | ... | relating to sticking duration |
| F01L 2009/0498 | ... | relating to gap between armature shaft and valve stem end |
| F01L 2013/00 | | Modifications of valve-gear to facilitate reversing, braking, starting, changing compression ratio, or other specific operations |
| F01L 2013/0005 | . | {Deactivating valves} |
| F01L 2013/001 | .. | Deactivating cylinders |
| F01L 2013/0015 | . | {for optimising engine performances by modifying valve lift according to various working parameters, e.g. rotational speed, load, torque} |
| F01L 2013/0036 | .. | {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} |
| F01L 2013/0052 | ... | with cams provided on an axially slidable sleeve |
| F01L 2013/0063 | .. | {by modification of cam contact point by displacing an intermediate lever or wedge-shaped intermediate element, e.g. Tourtelot} |
| F01L 2013/0068 | ... | with an oscillating cam acting on the valve of the "BMW-Valvetronic" type |
| F01L 2013/0073 | ... | with an oscillating cam acting on the valve of the "Delphi" type |
| F01L 2013/0078 | .. | by modification of cam contact point by axially displacing the camshaft |
| F01L 2013/0084 | .. | by modification of cam contact point by radially displacing the camshaft |
| F01L 2013/0089 | .. | with means for delaying valve closing |
| F01L 2013/0094 | ... | with switchable clamp for keeping valve open |
| F01L 2013/10 | . | Auxiliary actuators for variable valve timing |
| F01L 2013/101 | .. | Electromagnets |
| F01L 2013/103 | .. | Electric motors |
| F01L 2013/105 | .. | Hydraulic motors |
| F01L 2013/106 | .. | Pneumatic motors |
| F01L 2013/108 | .. | Centrifugal force |
| F01L 2013/11 | . | Sensors for variable valve timing |
| F01L 2013/111 | .. | Camshafts position or phase |
| F01L 2013/113 | .. | crankshafts position |
| F01L 2013/115 | .. | Pressure |
| F01L 2013/116 | .. | Temperature |
| F01L 2013/118 | .. | Valve lift |
| F01L 2101/00 | | Using particular materials |
| F01L 2101/02 | . | Using ceramic materials |

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| F01L 2103/00 | Manufacturing of components used in valve arrangements |
| F01L 2103/01 | . Tools for producing, mounting or adjusting, e.g. some part of the distribution |
| F01L 2103/02 | . Initial camshaft settings |
| F01L 2105/00 | Valve arrangements comprising rollers |
| F01L 2105/02 | . Mounting of rollers |
| F01L 2107/00 | Preventing the rotation of tappets |
| F01L 2109/00 | Self-contained lash adjusters |
| F01L 2111/00 | Differential gears located between crankshafts and camshafts for varying the timing of valves |
| F01L 2113/00 | Rotary valve drives |
| F01L 2201/00 | Electronic control systems; Apparatus or methods therefor |
| F01L 2250/00 | Camshaft drives characterised by their transmission means |
| F01L 2250/02 | . the camshaft being driven by chains |
| F01L 2250/04 | . the camshaft being driven by belts |
| F01L 2250/06 | . the camshaft being driven by gear wheels |
| F01L 2710/00 | Control of valve gear, speed or power |
| F01L 2710/003 | . Control of valve gear for two stroke engines |
| F01L 2710/006 | . Safety devices therefor |
| F01L 2740/00 | Control of slide-valve gear; Control pistons |
| F01L 2740/003 | . more than one slide-valve, e.g. for four stroke engines |
| F01L 2740/006 | . more than one slide-valve, e.g. for two stroke engines |
| F01L 2750/00 | Control of valve gear for four stroke engines directly driven by the crankshaft |

F01L 2760/00 Control of valve gear to facilitate reversing, starting, braking of four stroke engines

- F01L 2760/001 . for starting four stroke engines
- F01L 2760/002 . for reversing or starting four stroke engines
- F01L 2760/003 . for switching to compressor action in order to brake
- F01L 2760/004 . . whereby braking is exclusively produced by compression in the cylinders
- F01L 2760/005 . . 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
- F01L 2760/006 . for reversing two stroke engines
- F01L 2760/007 . for starting two stroke engines
- F01L 2760/008 . for reversing and restarting two stroke engines

F01L 2800/00 Methods of operation using a variable valve timing mechanism

- F01L 2800/01 . Starting
- F01L 2800/02 . Cold running
- F01L 2800/03 . Stopping; Stalling
- F01L 2800/04 . Timing control at idling
- F01L 2800/05 . Timing control under consideration of oil condition
- F01L 2800/06 . Timing or lift different for valves of same cylinder
- F01L 2800/08 . Timing or lift different for valves of different cylinders
- F01L 2800/09 . Calibrating
- F01L 2800/10 . Providing exhaust gas recirculation (EGR)
- F01L 2800/11 . Fault detection, diagnosis
- F01L 2800/12 . Fail safe operation
- F01L 2800/13 . Throttleless
- F01L 2800/14 . Determining a position, e.g. phase or lift
- F01L 2800/15 . Balancing of rotating parts
- F01L 2800/16 . Preventing interference

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| F01L 2800/17 | . Maintenance; Servicing |
| F01L 2800/18 | . Testing or simulation |
| F01L 2800/19 | . Valves opening several times per stroke |
| F01L 2810/00 | Arrangements solving specific problems in relation with valve gears |
| F01L 2810/01 | . Cooling |
| F01L 2810/02 | . Lubrication |
| F01L 2810/03 | . Reducing vibration |
| F01L 2810/04 | . Reducing noise |
| F01L 2810/05 | . Related to pressure difference on both sides of a valve |
| F01L 2820/00 | Details on specific features characterising valve gear arrangements |
| F01L 2820/01 | . Absolute values |
| F01L 2820/02 | . Formulas |
| F01L 2820/03 | . Auxiliary actuators |
| F01L 2820/031 | .. Electromagnets |
| F01L 2820/032 | .. Electric motors |
| F01L 2820/033 | .. Hydraulic engines |
| F01L 2820/034 | .. Pneumatic engines |
| F01L 2820/035 | .. Centrifugal forces |
| F01L 2820/04 | . Sensors |
| F01L 2820/041 | .. Camshafts position or phase sensors |
| F01L 2820/042 | .. Crankshafts position |
| F01L 2820/043 | .. Pressure |
| F01L 2820/044 | .. Temperature |
| F01L 2820/045 | .. Valve lift |