

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 21/18](#), [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](#).

Guidance heading: 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 1/24](#))); 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 . . { 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 }

Guidance heading: **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
- Guidance heading:** **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
- [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 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 |
| 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 |
| 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
- 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 strocke 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
- 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 |