

**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 }
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- 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
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- 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 }
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- 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 }
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- F01L 1/30 . . . characterised by the provision of positively opened and closed valves, i.e. desmodromic valves
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- F01L 1/32 . . . characterised by the provision of means for rotating lift valves, e.g. to diminish wear
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- 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 ( <a href="#">F01L 1/26</a> , <a href="#">F01L 1/28</a> take precedence)
F01L 1/40	.. for engines with scavenging charge near top dead centre position, e.g. by overlapping inlet and exhaust time ( <a href="#">scavenging aspects F02B</a> )
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 }
<b>F01L 3/00</b>	<b>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</b>
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 ( <a href="#">for rotating lift-valves F01L 1/32</a> )
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

#### Guidance heading:

**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 <a href="#">F01L 1/26</a> )
F01L 2001/18	.. Rocking arms or levers
<a href="#">F01L 2001/186</a>	... 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
<a href="#">F01L 2001/187</a>	... Clips, e.g. for retaining rocker arm on pivot
<a href="#">F01L 2001/188</a>	... 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
<a href="#">F01L 2001/2427</a>	.... by means of an hydraulic adjusting device located between cam and push rod
<a href="#">F01L 2001/2433</a>	.... Self contained, e.g. sealed hydraulic lash adjusters
<a href="#">F01L 2001/2438</a>	.... with means permitting forced opening of check valve
<a href="#">F01L 2001/2444</a>	.... Details relating to the hydraulic feeding circuit, e.g. lifter oil manifold assembly (LOMA)
F01L 2001/245	.... Hydraulic tappets
<a href="#">F01L 2001/256</a>	..... 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 }
<a href="#">F01L 2001/34423</a>	.... Details relating to the hydraulic feeding circuit
<a href="#">F01L 2001/34426</a>	..... Oil control valves
<a href="#">F01L 2001/3443</a>	..... Solenoid driven oil control valves
<a href="#">F01L 2001/34433</a>	..... Location oil control valves
<a href="#">F01L 2001/34436</a>	..... Features or method for avoiding malfunction due to foreign matters in oil
<a href="#">F01L 2001/3444</a>	..... Oil filters
<a href="#">F01L 2001/34443</a>	..... Cleaning control of oil control valves
<a href="#">F01L 2001/34446</a>	..... Fluid accumulators for the feeding circuit
<a href="#">F01L 2001/3445</a>	.... Details relating to the hydraulic means for changing the angular relationship
<a href="#">F01L 2001/34453</a>	..... Locking means between driving and driven members
<a href="#">F01L 2001/34456</a>	..... Locking in only one position
<a href="#">F01L 2001/34459</a>	..... Locking in multiple positions
<a href="#">F01L 2001/34463</a>	..... Locking position intermediate between most retarded and most advanced positions
<a href="#">F01L 2001/34466</a>	..... with multiple locking devices
<a href="#">F01L 2001/34469</a>	..... Lock movement parallel to camshaft axis
<a href="#">F01L 2001/34473</a>	..... Lock movement perpendicular to camshaft axis
<a href="#">F01L 2001/34476</a>	..... Restrict range locking means
<a href="#">F01L 2001/34479</a>	..... 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
<b>F01L 2003/00</b>		<b>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</b>
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
<b>F01L 2009/00</b>		<b>Valve-gear or valve arrangements actuated non-mechanically</b>
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

#### Guidance heading:

#### F01L 2101/00 Using particular materials

- F01L 2101/02 . Using ceramic materials

#### Guidance heading:

#### 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

<b>F01L 2105/00</b>	<b>Valve arrangements comprising rollers</b>
F01L 2105/02	. Mounting of rollers
<b>F01L 2107/00</b>	<b>Preventing the rotation of tappets</b>
<b>F01L 2109/00</b>	<b>Self-contained lash adjusters</b>
<b>F01L 2111/00</b>	<b>Differential gears located between crankshafts and camshafts for varying the timing of valves</b>
<b>F01L 2113/00</b>	<b>Rotary valve drives</b>
<b>F01L 2201/00</b>	<b>Electronic control systems; Apparatus or methods therefor</b>
<b>F01L 2250/00</b>	<b>Camshaft drives characterised by their transmission means</b>
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
<b>F01L 2710/00</b>	<b>Control of valve gear, speed or power</b>
F01L 2710/003	. Control of valve gear for two stroke engines
F01L 2710/006	. Safety devices therefor
<b>F01L 2740/00</b>	<b>Control of slide-valve gear; Control pistons</b>
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
<b>F01L 2750/00</b>	<b>Control of valve gear for four stroke engines directly driven by the crankshaft</b>
<b>F01L 2760/00</b>	<b>Control of valve gear to facilitate reversing, starting, braking of four stroke engines</b>
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
<b>F01L 2800/00</b>		<b>Methods of operation using a variable valve timing mechanism</b>
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
<b>F01L 2810/00</b>		<b>Arrangements solving specific problems in relation with valve gears</b>

- 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