

CPC COOPERATIVE PATENT CLASSIFICATION

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

NOTES

1. Groups [F01L 1/00](#) - [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](#) - [F01L 35/00](#).
3. Valve-gear arrangements specially adapted for machines or engines with variable working-fluid distribution are covered by groups [F01L 15/00](#) - [F01L 35/00](#).
4. Attention is drawn to the notes preceding class [F01](#), especially Note (3).
5. As regards the above-mentioned Note (3), attention is drawn to [F01B 3/10](#), [F01B 15/06](#), [F01C 21/18](#), [F02B 53/06](#), [F03C 1/08](#), [F04B 1/18](#), [F04B 7/00](#), [F04B 39/08](#), [F04B 39/10](#), and [F04C 15/06](#), [F04C 29/12](#).

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

1/00	Valve-gear or valve arrangements, e.g. lift-valve gear (lift-valve and valve-seat assemblies per se F01L 3/00 ; slide-valve gear F01L 5/00 ; actuated non-mechanically F01L 9/00 ; valve arrangements in working piston or piston rod F01L 11/00 ; modifications of valve-gear to facilitate reversing, braking, starting, changing compression ratio, or other specific operations F01L 13/00)	1/08	. . . Shape of cams
		1/10	. . by means of crank-or eccentric-driven rods { F01L 1/044 takes precedence}
		1/12	. Transmitting gear between valve drive and valve (simultaneously operating two or more valves F01L 1/26)
		1/14	. . Tappets {(hydraulic tappets for automatically adjusting or compensating clearance F01L 1/24)}; Push rods
		1/143	. . . {for use with overhead camshafts}
		1/146	. . . {Push-rods}
		1/16	. . . Silencing impact; Reducing wear
		1/18	. . Rocking arms or levers
1/02	. Valve drive (transmitting-gear between valve drive and valve F01L 1/12)	1/181	. . . {Centre pivot rocking arms}
1/022	. . {Chain drive}	1/182	. . . . {the rocking arm being pivoted about an individual fulcrum, i.e. not about a common shaft}
1/024	. . {Belt drive}		
1/026	. . {Gear drive}	1/183	. . . . . {of the boat type}
2001/028	. . {Pre-assembled timing arrangement, e.g. located in a cassette}	1/185	. . . {Overhead end-pivot rocking arms}
1/04	. . by means of cams, camshafts, cam discs, eccentrics or the like (F01L 1/10 takes precedence)	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}
1/042	. . . {Cam discs}	2001/187	. . . {Clips, e.g. for retaining rocker arm on pivot}
1/044	. . . {Reciprocating cams}	2001/188	. . . {Fulcrums at upper surface}
1/047	. . . Camshafts	1/20	. Adjusting or compensating clearance
2001/0471	. . . . {Assembled camshafts, e.g. "gebaute Nockenwelle"}	1/205	. . {by means of shims or the like}
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}	1/22	. . automatically, e.g. mechanically
2001/0475	. . . . . {Hollow camshafts (F01L 2001/0473 takes precedence)}	1/24	. . . by fluid means, e.g. hydraulically
2001/0476	. . . . . {Camshaft bearings}	1/2405	. . . . {by means of a hydraulic adjusting device located between the cylinder head and rocker arm}
2001/0478	. . . . . {Torque pulse compensated camshafts}	1/2411	. . . . {by means of a hydraulic adjusting device located between the valve stem and rocker arm}
1/053	. . . . . overhead type	1/2416	. . . . . {by means of a hydraulic adjusting device attached to an articulated rocker}
1/0532	. . . . . {the cams being directly in contact with the driven valve}	1/2422	. . . . . {by means or a hydraulic adjusting device located between the push rod and rocker arm}
2001/0535	. . . . . {Single overhead camshafts [SOHC]}	2001/2427	. . . . . {by means of an hydraulic adjusting device located between cam and push rod}
2001/0537	. . . . . {Double overhead camshafts [DOHC]}	2001/2433	. . . . . {Self contained, e.g. sealed hydraulic lash adjusters}
2001/054	. . . . . {Camshafts in cylinder block}		
1/06	. . . the cams, or the like, rotating at a higher speed than that corresponding to the valve cycle, e.g. operating fourstroke engine valves directly from crankshaft		

2001/2438	. . . . {with means permitting forced opening of check valve}	2001/34459	. . . . . {Locking in multiple positions}
2001/2444	. . . . {Details relating to the hydraulic feeding circuit, e.g. lifter oil manifold assembly [LOMA]}	2001/34463	. . . . . {Locking position intermediate between most retarded and most advanced positions}
1/245	. . . . Hydraulic tappets	2001/34466	. . . . . {with multiple locking devices}
1/25	. . . . . between cam and valve stem	2001/34469	. . . . . {Lock movement parallel to camshaft axis}
1/252	. . . . . {for side-valve engines}	2001/34473	. . . . . {Lock movement perpendicular to camshaft axis}
1/255	. . . . . between cam and rocker arm	2001/34476	. . . . . {Restrict range locking means}
2001/256	. . . . . {between cam and push rod}	2001/34479	. . . . . {Sealing of phaser devices}
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)	2001/34483	. . . . . {Phaser return springs}
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)}	2001/34486	. . . {Location and number of the means for changing the angular relationship}
1/265	. . {peculiar to machines or engines with three or more intake valves per cylinder}	2001/34489	. . . . {Two phasers on one camshaft}
1/267	. . {with means for varying the timing or the lift of the valves}	2001/34493	. . . . {Dual independent phasing system [DIPS]}
1/28	. characterised by the provision of coaxial valves; characterised by the provision of valves co-operating with both intake and exhaust ports	2001/34496	. . . . {Two phasers on different camshafts}
1/285	. . {Coaxial intake and exhaust valves}	1/348	. . . by means acting on timing belts or chains
1/30	. characterised by the provision of positively opened and closed valves, i.e. desmodromic valves	1/352	. . . using bevel or epicyclic gear
1/32	. characterised by the provision of means for rotating lift valves, e.g. to diminish wear	2001/3521	. . . . {Harmonic drive of flexspline type}
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}	2001/3522	. . . . {with electromagnetic brake}
1/344	. . changing the angular relationship between crankshaft and camshaft, e.g. using helicoidal gear	1/356	. . . making the angular relationship oscillate, {e.g. non-homokinetic drive}
1/34403	. . . {using helically teathed sleeve or gear moving axially between crankshaft and camshaft}	1/36	. peculiar to machines or engines of specific type other than four-stroke cycle
1/34406	. . . . {the helically teathed sleeve being located in the camshaft driving pulley}	1/38	. . for engines with other than four-stroke cycle, e.g. with two-stroke cycle (F01L 1/26 , F01L 1/28 take precedence)
1/34409	. . . {by torque-responsive means}	1/40	. . for engines with scavenging charge near top dead centre position, e.g. by overlapping inlet and exhaust time (scavenging aspects F02B)
1/34413	. . . {using composite camshafts, e.g. with cams being able to move relative to the camshaft}	1/42	. . for machines or engines characterised by cylinder arrangements, e.g. star or fan
1/34416	. . . {using twisted cams}	1/44	. Multiple-valve gear or arrangements, not provided for in preceding subgroups, e.g. with lift and different valves
1/3442	. . . {using hydraulic chambers with variable volume to transmit the rotating force}	1/443	. . {comprising a lift valve and at least one rotary valve}
2001/34423	. . . . {Details relating to the hydraulic feeding circuit}	1/446	. . {comprising a lift valve and at least one reed valve}
2001/34426	. . . . . {Oil control valves}	1/46	. Component parts, details, or accessories, not provided for in preceding subgroups
2001/3443	. . . . . {Solenoid driven oil control valves}	1/462	. . {Valve return spring arrangements}
2001/34433	. . . . . {Location oil control valves}	1/465	. . . {Pneumatic arrangements}
2001/34436	. . . . . {Features or method for avoiding malfunction due to foreign matters in oil}	2001/467	. . {Lost motion springs}
2001/3444	. . . . . {Oil filters}	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
2001/34443	. . . . . {Cleaning control of oil control valves}	3/02	. Selecting particular materials for valve-members or valve-seats; Valve-members or valve-seats composed of two or more materials
2001/34446	. . . . . {Fluid accumulators for the feeding circuit}	3/04	. . Coated valve members or valve-seats
2001/3445	. . . . . {Details relating to the hydraulic means for changing the angular relationship}	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)
2001/34453	. . . . . {Locking means between driving and driven members}	3/08	. Valves guides; Sealing of valve stem, e.g. sealing by lubricant
2001/34456	. . . . . {Locking in only one position}	3/085	. . {Valve cages}
		3/10	. Connecting springs to valve members

2003/11	. {Connecting valve members to rocker arm or tappet}	7/022	. . . {Cylindrical valves having one recess communicating successively with aligned inlet and exhaust ports}
3/12	. Cooling of valves		
3/14	. . by means of a liquid or solid coolant, e.g. sodium, in a closed chamber in a valve	7/023	. . . {Cylindrical valves having a hollow or partly hollow body allowing axial inlet or exhaust fluid circulation}
3/16	. . by means of a fluid flowing through or along valve, e.g. air (for sealing only F01L 3/08)	7/024	. . . {Cylindrical valves comprising radial inlet and axial outlet or axial inlet and radial outlet}
3/18	. . . Liquid cooling of valve	7/025	. . . {Cylindrical valves comprising radial inlet and side outlet or side inlet and radial outlet}
3/20	. Shapes or constructions of valve members, not provided for in preceding subgroups of this group	7/026	. . {with two or more rotary valves, their rotational axes being parallel, e.g. 4-stroke}
3/205	. . {Reed valves}	7/027	. . {with two or more valves arranged coaxially (F01L 7/045 takes precedence)}
3/22	. Valve-seats not provided for in preceding subgroups of this group; Fixing of valve-seats	7/028	. . {having the rotational axis coaxial with the cylinder axis and the valve surface not surrounding piston or cylinder}
3/24	. Safety means or accessories, not provided for in preceding sub- groups of this group	7/029	. . {having the rotational axis of the valve parallel to the cylinder axis}
2003/25	. {Valve configurations in relation to engine}	7/04	. . Surrounding working cylinder or piston
2003/251	. . {Large number of valves, e.g. five or more}	7/045	. . . {with two or more valves arranged coaxially}
2003/253	. . {configured parallel to piston axis}	7/06	. with disc type valves
2003/255	. . {configured other than parallel or symmetrical relative to piston axis}	7/08	. with conically or frusto-conically shaped valves
2003/256	. . {configured other than perpendicular to camshaft axis}	7/10	. with valves of other specific shape, e.g. spherical
2003/258	. . {opening away from cylinder}	7/12	. specially for two-stroke engines (F01L 7/04 takes precedence)
5/00	Slide valve-gear or valve-arrangements (with pure rotary or oscillatory movement F01L 7/00)	7/14	. Multiple-valve arrangements (with valves surrounding working cylinder or piston F01L 7/04; specially for two-stroke engines F01L 7/12)
5/02	. with other than cylindrical, sleeve or part annularly shaped valves, e.g. with flat-type valves	7/16	. Sealing or packing arrangements specially therefor
5/04	. with cylindrical, sleeve, or part-annularly shaped valves	7/18	. Component parts, details, or accessories not provided for in preceding sub-groups of this group
5/045	. . {Piston-type or cylinder-type valves arranged above the piston and coaxial with the cylinder axis}	9/00	Valve-gear or valve arrangements actuated non-mechanically
5/06	. . surrounding working cylinder or piston	9/02	. by fluid means, e.g. hydraulic
5/08	. . . Arrangements with several movements or several valves, e.g. one valve inside the other (with part-annularly shaped valves F01L 5/12)	9/021	. . {the action of a cam being transmitted to a valve by a fluid column, e.g. a fluid conduit}
5/10	. . . . with reciprocating and other movements of the same valve	9/023	. . . {Hydraulic lifters, i.e. fluid chamber comprised between a piston actuated by a cam and a piston acting on a valve stem}
5/12	. . . Arrangements with part-annularly-shaped valves	9/025	. . . . {the volume of the chamber being variable, e.g. for varying the lift or the timing of a valve}
5/14	. characterised by the provision of valves with reciprocating and other movements (surrounding working cylinder or piston F01L 5/06)	9/026	. . {Pneumatic}
5/16	. . with reciprocating and other movement of same valve, e.g. longitudinally of working cylinder and in cross direction	2009/028	. . {Boost means, i.e. means for increasing initial opening force of the valve}
5/18	. . with reciprocating valve and other slide valve	9/04	. by electric means
5/20	. specially for two-stroke engines (F01L 5/06 and F01L 5/14 take precedence)	2009/0401	. . {Driving circuits therefor}
5/22	. Multiple-valve arrangements (with valves surrounding working cylinder or piston F01L 5/06; with reciprocating and other slide valves F01L 5/18; specially for two-stroke engines F01L 5/20)	2009/0403	. . {Electromagnetic actuators comprising one coil}
5/24	. Component parts, details or accessories, not provided for in preceding subgroups in this group	2009/0405	. . {Electromagnetic actuators comprising two or more coils}
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)	2009/0407	. . . {The two coils being disposed coaxially to the armature shaft}
7/02	. with cylindrical, sleeve, or part-annularly shaped valves (of disc type F01L 7/06; of conical type F01L 7/08)	2009/0409	. . . {The armature being articulated perpendicularly to the coils axes}
7/021	. . {with one rotary valve}	2009/0411	. . {Electromagnetic actuators using a rotary motor}
		2009/0413	. . {Piezo electric actuators}
		2009/0415	. . {Moving coil actuators}
		2009/0417	. . {Floating actuators for varying the valve stroke}
		2009/0419	. . {Actuator position setting device, e.g. initial setting}
		2009/0421	. . {Mixed arrangement with both mechanically and electromagnetically actuated valves}

2009/0423	. . . {Electromagnetic actuators construction details}	13/0015	. {for optimising engine performances by modifying valve lift according to various working parameters, e.g. rotational speed, load, torque}
2009/0425	. . . {Shaft and armature construction}	13/0021	. . {by modification of rocker arm ratio}
2009/0426	. . . . {Arrangements for amplifying the armature stroke}	13/0026	. . . {by means of an eccentric}
2009/0428	. . . {Core and coil construction}	13/0031	. . {by modification of tappet or pushrod length}
2009/043	. . . {Casing construction}	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}
2009/0432	. . . {Biasing means}	13/0042	. . . {with cams being profiled in axial and radial direction}
2009/0434	. . . . {Helical springs}	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}
2009/0436	. . . . . {Two opposed springs for intermediate resting position of the armature}	2013/0052	. . . {with cams provided on an axially slidable sleeve}
2009/0438	. . . . {Torsion springs}	13/0057	. . {by splittable or deformable cams}
2009/044	. . . . {Pneumatic springs}	13/0063	. . {by modification of cam contact point by displacing an intermediate lever or wedge-shaped intermediate element, e.g. Tourtelot}
2009/0442	. . . . {Means for varying the spring bias}	2013/0068	. . . {with an oscillating cam acting on the valve of the "BMW-Valvetronic" type}
2009/0444	. . . . {Means for connecting springs to valve or anchor}	2013/0073	. . . {with an oscillating cam acting on the valve of the "Delphi" type}
2009/0446	. . . {Latching means}	2013/0078	. . {by modification of cam contact point by axially displacing the camshaft}
2009/0448	. . . . {using permanent magnet}	2013/0084	. . {by modification of cam contact point by radially displacing the camshaft}
2009/0449	. . . {Means for varying the air gap}	2013/0089	. . {with means for delaying valve closing}
2009/0451	. . . {Damping means}	2013/0094	. . . {with switchable clamp for keeping valve open}
2009/0453	. . . {Means for counteracting cylinder pressure}	13/02	. for reversing
2009/0455	. . . {Lash adjusting means}	13/04	. for starting by means of fluid pressure
2009/0457	. . . {Actor cooling means}	13/06	. for braking
2009/0459	. . . {Means for facilitating assembly}	13/065	. . {Compression release engine retarders of the "Jacobs Manufacturing" type}
2009/0461	. . . {Wiring}	13/08	. for decompression, e.g. during starting; for changing compression ratio
2009/0463	. . . . {Connectors}	13/085	. . {the valve-gear having an auxiliary cam protruding from the main cam profile}
2009/0465	. . . . {Harnesses}	2013/10	. {Auxiliary actuators for variable valve timing}
2009/0467	. . . {Sensing means}	2013/101	. . {Electromagnets}
2009/0469	. . . . {Position sensors}	2013/103	. . {Electric motors}
2009/0471	. . . . {Vibration sensors}	2013/105	. . {Hydraulic motors}
2009/0473	. . . . {Temperature sensors}	2013/106	. . {Pneumatic motors}
2009/0474	. . . . {Flux sensors}	2013/108	. . {Centrifugal force}
2009/0476	. . . . {Spring force sensors}	2013/11	. {Sensors for variable valve timing}
2009/0478	. . {Electromagnetic actuators; Method of operation thereof}	2013/111	. . {Camshafts position or phase}
2009/048	. . . {Engine starting}	2013/113	. . {crankshafts position}
2009/0482	. . . . {in normal conditions}	2013/115	. . {Pressure}
2009/0484	. . . . {Cold start}	2013/116	. . {Temperature}
2009/0486	. . . {Soft landing, e.g. applying braking current; Levitation of armature close to core surface}	2013/118	. . {Valve lift}
2009/0488	. . . {Fail safe, e.g. valve kept closed if not opening properly}		
2009/049	. . . {Determination of valve speed}		
2009/0492	. . . {Determination of valve timing during particular working conditions, e.g. deceleration}		
2009/0494	. . . {Engine stopping; Engine stall}		
2009/0496	. . . {relating to sticking duration}		
2009/0498	. . . {relating to gap between armature shaft and valve stem end}		
11/00	Valve arrangements in working piston or piston-rod		
11/02	. in piston		
11/04	. . operated by movement of connecting-rod		
11/06	. . . operating oscillatory valve		
13/00	Modifications of valve-gear to facilitate reversing, braking, starting, changing compression ratio, or other specific operations		
13/0005	. {Deactivating valves}		
2013/001	. . {Deactivating cylinders}		
			<u>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</u>
			<u>NOTE</u>
			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

(continued) adjustment during operation, tripping-gear, reversing-gear, use of pistons or piston-rods as valves or as valve-supporting elements, valve-gear or valve arrangements peculiar to free-piston machines or engines

15/00 Valve-gear or valve arrangements, e.g. with reciprocatory slide valves, other than provided for in groups [F01L 17/00](#) - [F01L 29/00](#) (valve drive or external valve-adjustment during operation, see the relevant groups, e.g. [F01L 31/00](#); tripping-gear or tripping of valves [F01L 31/00](#))

- 15/02 . with valves other than cylindrical, sleeve, or part-annularly-shaped, e.g. flat D-valves
- 15/04 . . main valve being combined with auxiliary valve (of drag valve type [F01L 15/10](#))
- 15/06 . . . of Meyer or Rider type, i.e. in which the expansion is varied at the expansion valve itself
- 15/08 . with cylindrical, sleeve, or part-annularly-shaped valves; Such main valves combined with auxiliary valves
- 15/10 . with main slide valve and auxiliary valve dragged thereby
- 15/12 . characterised by having means for effecting pressure equilibrium between two different cylinder spaces at idling
- 15/14 . Arrangements with several co-operating main valves, e.g. reciprocatory and rotary
- 15/16 . . with reciprocatory slide valves only
- 15/18 . Valves arrangements not provided for in preceding sub-groups of this main group
- 15/20 . Component parts, details, or accessories, not provided for in preceding sub-groups of this main group

17/00 Slide valve-gear or valve arrangements with cylindrical, sleeve, or part annularly-shaped valves surrounding working cylinder or piston

- 17/02 . Drive or adjustment during operation, peculiar thereto, e.g. for reciprocating and oscillating movements or for several valves one inside the other

19/00 Slide valve-gear or valve arrangements with reciprocatory and other movement of same valve, other than provided for in [F01L 17/00](#), e.g. longitudinally of working cylinder and in cross direction

- 19/02 . Drive or adjustment during operation, peculiar thereto

21/00 Use of working pistons or pistons-rods as fluid-distributing valves or a valve-supporting elements, e.g. in free-piston machines

- 21/02 . Piston or piston-rod used as valve members {([F01L 25/066](#) takes precedence)}
- 21/04 . Valves arranged in or on piston or piston-rod

23/00 Valves controlled by impact by piston, e.g. in free-piston machines {([F01L 25/063](#) takes precedence)}

25/00 Drive, or adjustment during the operation, or distribution or expansion valves by non-mechanical means

- 25/02 . by fluid means
- 25/04 . . by working-fluid of machine or engine, e.g. free-piston machine

- 25/06 . . . Arrangement with main and auxiliary valves, at least one of them being fluid-driven
- 25/063 {the auxiliary valve being actuated by the working motor-piston or piston-rod}
- 25/066 {piston or piston-rod being used as auxiliary valve}
- 25/08 . by electric or magnetic means

27/00 Distribution or expansion valve-gear peculiar to free-piston machines or engines and not provided for in [F01L 21/00](#) - [F01L 25/00](#)

- 27/02 . the machine or engine having rotary or oscillatory valves
- 27/04 . Delayed-action controls, e.g. of cataract or dashpot type

29/00 Reversing gear (equally usable for control of degree of working-fluid admission and reversing being of secondary-importance [F01L 31/00](#))

- 29/02 . by displacing eccentric
- 29/04 . by links or guide rods
- 29/06 . by interchanging inlet and exhaust ports
- 29/08 . specially for rotary or oscillatory valves
- 29/10 . Details, e.g. drive
- 29/12 . . Powered reverse gear

31/00 Valve drive, valve adjustment during operation, or other valve control, not provided for in groups [F01L 15/00](#) - [F01L 29/00](#) (sensing elements measuring the variable or condition to be controlled or regulated [F01B](#))

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

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

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

- 33/02 . rotary

33/04	. oscillatory	2760/006	. for reversing two stroke engines
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 - F01L 31/00)	2760/007	. for starting two stroke engines
35/02	. Valves	2760/008	. for reversing and restarting two strocke engines
35/04	. Arrangements of valves in the machine or engine, e.g. relative to working cylinder	2800/00	Methods of operation using a variable valve timing mechanism
<hr/>		2800/01	. Starting
2101/00	Using particular materials	2800/02	. Cold running
2101/02	. Using ceramic materials	2800/03	. Stopping; Stalling
2103/00	Manufacturing of components used in valve arrangements	2800/04	. Timing control at idling
2103/01	. Tools for producing, mounting or adjusting, e.g. some part of the distribution	2800/05	. Timing control under consideration of oil condition
2103/02	. Initial camshaft settings	2800/06	. Timing or lift different for valves of same cylinder
2105/00	Valve arrangements comprising rollers	2800/08	. Timing or lift different for valves of different cylinders
2105/02	. Mounting of rollers	2800/09	. Calibrating
2107/00	Preventing the rotation of tappets	2800/10	. Providing exhaust gas recirculation [EGR]
2109/00	Self-contained lash adjusters	2800/11	. Fault detection, diagnosis
2111/00	Differential gears located between crankshafts and camshafts for varying the timing of valves	2800/12	. Fail safe operation
2113/00	Rotary valve drives	2800/13	. Throttleless
2201/00	Electronic control systems; Apparatus or methods therefor	2800/14	. Determining a position, e.g. phase or lift
2250/00	Camshaft drives characterised by their transmission means	2800/15	. Balancing of rotating parts
2250/02	. the camshaft being driven by chains	2800/16	. Preventing interference
2250/04	. the camshaft being driven by belts	2800/17	. Maintenance; Servicing
2250/06	. the camshaft being driven by gear wheels	2800/18	. Testing or simulation
2710/00	Control of valve gear, speed or power	2800/19	. Valves opening several times per stroke
2710/003	. Control of valve gear for two stroke engines	2810/00	Arrangements solving specific problems in relation with valve gears
2710/006	. Safety devices therefor	2810/01	. Cooling
2740/00	Control of slide-valve gear; Control pistons	2810/02	. Lubrication
2740/003	. more than one slide-valve, e.g. for four stroke engines	2810/03	. Reducing vibration
2740/006	. more than one slide-valve, e.g. for two stroke engines	2810/04	. Reducing noise
2750/00	Control of valve gear for four stroke engines directly driven by the crankshaft	2810/05	. Related to pressure difference on both sides of a valve
2760/00	Control of valve gear to facilitate reversing, starting, braking of four stroke engines	2820/00	Details on specific features characterising valve gear arrangements
2760/001	. for starting four stroke engines	2820/01	. Absolute values
2760/002	. for reversing or starting four stroke engines	2820/02	. Formulas
2760/003	. for switching to compressor action in order to brake	2820/03	. Auxiliary actuators
2760/004	. . whereby braking is exclusively produced by compression in the cylinders	2820/031	. . Electromagnets
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	2820/032	. . Electric motors
		2820/033	. . Hydraulic engines
		2820/034	. . Pneumatic engines
		2820/035	. . Centrifugal forces
		2820/04	. Sensors
		2820/041	. . Camshafts position or phase sensors
		2820/042	. . Crankshafts position
		2820/043	. . Pressure
		2820/044	. . Temperature
		2820/045	. . Valve lift