CPC COOPERATIVE PATENT CLASSIFICATION

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

ENGINES OR PUMPS

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

F01L CYCLICALLY OPERATING VALVES FOR MACHINES OR ENGINES

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.

WARNING

The following IPC groups are not in the CPC scheme. The subject matter for these IPC groups is classified in the following CPC groups:

F01L 31/20	covered by	F01L 31/08 - F01L 31/18
F01L 31/22	covered by	F01L 31/08 - F01L 31/18
F01L 31/24	covered by	F01L 31/08 - F01L 31/18

Valve-gear or valve arrangements for positive-displacement machines or engines other than steam engines, e.g. for internal-combustion piston engines, without provision for variable fluid distribution

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

1/02 . Valve drive (transmitting-gear between valve drive and valve F01L 1/12)

1/022 . . {Chain drive}

1/024 . . {Belt drive}

1/026 . . {Gear drive}

2001/028 . . {Pre-assembled timing arrangement, e.g. located in a cassette}

1/04 . . by means of cams, camshafts, cam discs, eccentrics or the like (F01L 1/10 takes precedence)

1/042 . . . {Cam discs}

1/044 . . . {Reciprocating cams}

WARNING

Group F01L 1/044 is impacted by reclassification into group F01L 1/10.

Groups F01L 1/044 and F01L 1/10 should be considered in order to perform a complete search.

1/047 . . . Camshafts

2001/0471 . . . . {Assembled camshafts}

2001/0473 . . . . . {Composite camshafts, e.g. with cams or cam sleeve being able to move relative to the inner camshaft or a cam adjusting rod}

2001/0475 . . . . {Hollow camshafts}

2001/0476 . . . . {Camshaft bearings}

2001/0478 . . . . {Torque pulse compensated camshafts}

1/053 . . . . overhead type

1/0532 . . . . . {the cams being directly in contact with the driven valve}

2001/0535 . . . . . {Single overhead camshafts [SOHC]}

2001/0537 . . . . . {Double overhead camshafts [DOHC]}

2001/054 . . . . {Camshafts in cylinder block}

1/06 . . . the cams, or the like, rotating at a higher speed than that corresponding to the valve cycle, e.g. operating fourstroke engine valves directly from crankshaft

1/08 . . . Shape of cams

1/10 . . by means of crank-or eccentric-driven rods

WARNING

Group F01L 1/10 is incomplete pending reclassification of documents from group F01L 1/044.

Groups F01L 1/044 and F01L 1/10 should be considered in order to perform a complete search.

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
1/181 . . . {Centre pivot rocking arms}
1/182 . . . . {the rocking arm being pivoted about an individual fulcrum, i.e. not about a common shaft}
1/183 . . . . . {of the boat type}
1/185 . . . {Overhead end-pivot rocking arms}
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}
2001/187 . . . {Clips, e.g. for retaining rocker arm on pivot}
2001/188 . . . {Fulcrums at upper surface}
1/20 . Adjusting or compensating clearance
1/205 . . {by means of shims or the like}
1/22 . . automatically, e.g. mechanically
1/24 . . . by fluid means, e.g. hydraulically
1/2405 . . . . {by means of a hydraulic adjusting device located between the cylinder head and rocker arm}
1/2411 . . . . {by means of a hydraulic adjusting device located between the valve stem and rocker arm}
1/2416 . . . . {by means of a hydraulic adjusting device attached to an articulated rocker}
1/2422 . . . . {by means or a hydraulic adjusting device located between the push rod and rocker arm}
2001/2427 . . . . {by means of an hydraulic adjusting device located between cam and push rod}
2001/2433 . . . . {Self contained, e.g. sealed hydraulic lash adjusters}
2001/2438 . . . . {with means permitting forced opening of check valve}
2001/2444 . . . . {Details relating to the hydraulic feeding circuit, e.g. lifter oil manifold assembly [LOMA]}
1/245 . . . . Hydraulic tappets
1/25 . . . . . between cam and valve stem
1/252 . . . . . {for side-valve engines}
1/255 . . . . . between cam and rocker arm
2001/256 . . . . . {between cam and push rod}
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)
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)}
1/265 . . {peculiar to machines or engines with three or more intake valves per cylinder}
1/267 . . {with means for varying the timing or the lift of the valves}
1/28 . characterised by the provision of coaxial valves; characterised by the provision of valves co-operating with both intake and exhaust ports
1/285 . . {Coaxial intake and exhaust valves}
1/30 . characterised by the provision of positively opened and closed valves, i.e. desmodromic valves
1/32 . characterised by the provision of means for rotating lift valves, e.g. to diminish wear
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}
1/344 . . changing the angular relationship between crankshaft and camshaft, e.g. using helicoidal gear
1/34403 . . . {using helically teethed sleeve or gear moving axially between crankshaft and camshaft}
1/34406 . . . . {the helically teethed sleeve being located in the camshaft driving pulley}
1/34409 . . . {by torque-responsive means}
1/34413 . . . {using composite camshafts, e.g. with cams being able to move relative to the camshaft}
1/34416 . . . {using twisted cams}
1/3442 . . . {using hydraulic chambers with variable volume to transmit the rotating force}
2001/34423 . . . . {Details relating to the hydraulic feeding circuit}
2001/34426 . . . . . {Oil control valves}
2001/3443 . . . . . {Solenoid driven oil control valves}
2001/34433 . . . . . {Location oil control valves}
2001/34436 . . . . . {Features or method for avoiding malfunction due to foreign matters in oil}
2001/3444 . . . . . {Oil filters}
2001/34443 . . . . . {Cleaning control of oil control valves}
2001/34446 . . . . . {Fluid accumulators for the feeding circuit}
2001/3445 . . . . {Details relating to the hydraulic means for changing the angular relationship}
2001/34453 . . . . . {Locking means between driving and driven members}
2001/34456 . . . . . {Locking in only one position}
2001/34459 . . . . . {Locking in multiple positions}
2001/34463 . . . . . {Locking position intermediate between most retarded and most advanced positions}
2001/34466 . . . . . {with multiple locking devices}
2001/34469 . . . . . {Lock movement parallel to camshaft axis}
2001/34473 . . . . . {Lock movement perpendicular to camshaft axis}
2001/34476 . . . . . {Restrict range locking means}
2001/34479 . . . . . {Sealing of phaser devices}
2001/34483 . . . . . {Phaser return springs}
2001/34486 . . . {Location and number of the means for changing the angular relationship}
2001/34489 . . . . {Two phasers on one camshaft}
2001/34493 . . . . {Dual independent phasing system [DIPS]}
2001/34496 . . . . {Two phasers on different camshafts}
1/348 . . . by means acting on timing belts or chains
1/352 . . . using bevel or epicyclic gear
2001/3521 . . . . {Harmonic drive of flexspline type}
2001/3522 . . . . {with electromagnetic brake}
1/356 . . . making the angular relationship oscillate {, e.g. non-homokinetic drive}
1/36 . peculiar to machines or engines of specific type other than four-stroke cycle

1/38 . . for engines with other than four-stroke cycle, e.g. with two-stroke cycle (F01L 1/26, F01L 1/28 take precedence)
1/40 . . for engines with scavenging charge near top dead centre position, e.g. by overlapping inlet and exhaust time
1/42 . . for machines or engines characterised by cylinder arrangements, e.g. star or fan
1/44 . Multiple-valve gear or arrangements, not provided for in preceding subgroups, e.g. with lift and different valves
1/443 . . {comprising a lift valve and at least one rotary valve}
1/446 . . {comprising a lift valve and at least one reed valve}
1/46 . Component parts, details, or accessories, not provided for in preceding subgroups
1/462 . . {Valve return spring arrangements}
1/465 . . . {Pneumatic arrangements}
2001/467 . . {Lost motion springs}

3/00 Lift-valve, i.e. cut-off apparatus with closure members having at least a component of their opening and closing motion perpendicular to the closing faces; Parts or accessories thereof

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

5/00 Slide valve-gear or valve-arrangements (with pure rotary or oscillatory movement F01L 7/00)

5/02 . with other than cylindrical, sleeve or part annularly shaped valves, e.g. with flat-type valves
5/04 . with cylindrical, sleeve, or part-annularly shaped valves
5/045 . . {Piston-type or cylinder-type valves arranged above the piston and coaxial with the cylinder axis}
5/06 . . surrounding working cylinder or piston
5/08 . . . Arrangements with several movements or several valves, e.g. one valve inside the other (with part-annularly shaped valves F01L 5/12)
5/10 . . . . with reciprocating and other movements of the same valve
5/12 . . . Arrangements with part-annularly-shaped valves
5/14 . characterised by the provision of valves with reciprocating and other movements (surrounding working cylinder or piston F01L 5/06)
5/16 . . with reciprocating and other movement of same valve, e.g. longitudinally of working cylinder and in cross direction
5/18 . . with reciprocatory valve and other slide valve
5/20 . specially for two-stroke engines (F01L 5/06, F01L 5/14 take precedence)
5/22 . Multiple-valve arrangements (with valves surrounding working cylinder or piston F01L 5/08; with reciprocatory and other slide valves F01L 5/18; specially for two-stroke engines F01L 5/20)
5/24 . Component parts, details or accessories, not provided for in preceding subgroups in this group

7/00 Rotary or oscillatory slide valve-gear or valve arrangements (slide valves with combined rotary and non-rotary movements, combinations of rotary and non-rotary slide valves F01L 5/00)

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

7/14 . Multiple-valve arrangements (with valves surrounding working cylinder or piston F01L 7/04; specially for two-stroke engines F01L 7/12)
7/16 . Sealing or packing arrangements specially therefor
7/18 . Component parts, details, or accessories not provided for in preceding subgroups of this group

9/00 Valve-gear or valve arrangements actuated non-mechanically

9/10 . by fluid means, e.g. hydraulic
9/11 . . in which the action of a cam is being transmitted to a valve by a liquid column
9/12 . . . with a liquid chamber between a piston actuated by a cam and a piston acting on a valve stem
9/14 . . . . the volume of the chamber being variable, e.g. for varying the lift or the timing of a valve
9/16 . . Pneumatic means
9/18 . . Means for increasing the initial opening force on the valve
9/20 . by electric means
9/21 . . actuated by solenoids
2009/2103 . . . {comprising one coil}
2009/2105 . . . {comprising two or more coils}
2009/2107 . . . . {being disposed coaxially to the armature shaft}
2009/2109 . . . . {The armature being articulated perpendicularly to the coils axes}
2009/2115 . . . {Moving coil actuators}
2009/2117 . . . {Floating actuators for varying the valve stroke}
2009/2125 . . . {Shaft and armature construction}
2009/2126 . . . . {Arrangements for amplifying the armature stroke}
2009/2128 . . . {Core and coil construction}
2009/213 . . . {Casing construction}
2009/2132 . . . {Biasing means}
2009/2134 . . . . {Helical springs}
2009/2136 . . . . . {Two opposed springs for intermediate resting position of the armature}
2009/2138 . . . . {Torsion springs}
2009/214 . . . . {Pneumatic springs}
2009/2142 . . . . {Means for varying the spring bias}
2009/2144 . . . . {Means for connecting springs to valve or anchor}
2009/2146 . . . {Latching means}
2009/2148 . . . . {using permanent magnet}
2009/2149 . . . {Means for varying the air gap}
2009/2151 . . . {Damping means}
2009/2153 . . . {Means for counteracting cylinder pressure}
2009/2155 . . . {Lash adjusting means}
2009/2157 . . . {Actuator cooling means}
2009/2159 . . . {Means for facilitating assembly}
2009/2161 . . . {Wiring}
2009/2163 . . . . {Connectors}
2009/2165 . . . . {Harnesses}
2009/2167 . . . {Sensing means}
2009/2169 . . . . {Position sensors}
2009/2171 . . . . {Vibration sensors}
2009/2173 . . . . {Temperature sensors}
2009/2174 . . . . {Flux sensors}
2009/2176 . . . . {Spring force sensors}
9/22 . . actuated by rotary motors
9/24 . . Piezo-electric actuators
2009/25 . . {Mixed arrangement with both mechanically and electromagnetically actuated valves}
9/26 . . Driving circuits therefor
9/30 . Arrangements for setting the actuator position, e.g. the initial position
9/40 . Methods of operation thereof; Control of valve actuation, e.g. duration or lift
2009/408 . . {Engine starting}
2009/4082 . . . {in normal conditions}
2009/4084 . . . {Cold start}
2009/4086 . . {Soft landing, e.g. applying braking current; Levitation of armature close to core surface}
2009/4088 . . {Fail safe, e.g. valve kept closed if not opening properly}
2009/409 . . {Determination of valve speed}
2009/4092 . . {Determination of valve timing during particular working conditions, e.g. deceleration}
2009/4094 . . {Engine stopping; Engine stall}
2009/4096 . . {relating to sticking duration}
2009/4098 . . {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}
13/0015 . {for optimising engine performances by modifying valve lift according to various working parameters, e.g. rotational speed, load, torque}
13/0021 . . {by modification of rocker arm ratio}
13/0026 . . . {by means of an eccentric}
13/0031 . . {by modification of tappet or pushrod length}
13/0036 . . {the valves being driven by two or more cams with different shape, size or timing or a single cam profiled in axial and radial direction}
13/0042 . . . {with cams being profiled in axial and radial direction}
13/0047 . . . {the movement of the valves resulting from the sum of the simultaneous actions of at least two cams, the cams being independently variable in phase in respect of each other}
2013/0052 . . . {with cams provided on an axially slidable sleeve}
13/0057 . . {by splittable or deformable cams}
13/0063 . . {by modification of cam contact point by displacing an intermediate lever or wedge-shaped intermediate element, e.g. Tourtelot}
2013/0068 . . . {with an oscillating cam acting on the valve of the "BMW-Valvetronic" type}
2013/0073 . . . {with an oscillating cam acting on the valve of the "Delphi" type}
2013/0078 . . {by modification of cam contact point by axially displacing the camshaft}
2013/0084 . . {by modification of cam contact point by radially displacing the camshaft}

2013/0089 . . {with means for delaying valve closing}
2013/0094 . . . {with switchable clamp for keeping valve open}
13/02 . for reversing
13/04 . for starting by means of fluid pressure
13/06 . for braking
13/065 . . {Compression release engine retarders of the "Jacobs Manufacturing" type}
13/08 . for decompression, e.g. during starting; for changing compression ratio
13/085 . . {the valve-gear having an auxiliary cam protruding from the main cam profile}
2013/10 . {Auxiliary actuators for variable valve timing}
2013/101 . . {Electromagnets}
2013/103 . . {Electric motors}
2013/105 . . {Hydraulic motors}
2013/106 . . {Pneumatic motors}
2013/108 . . {Centrifugal force}
2013/11 . {Sensors for variable valve timing}
2013/111 . . {Camshafts position or phase}
2013/113 . . {crankshafts position}
2013/115 . . {Pressure}
2013/116 . . {Temperature}
2013/118 . . {Valve lift}

Valve-gear or valve arrangements specially adapted for steam engines, or specially adapted for other positive-displacement machines or engines with variable working-fluid distribution

NOTES

1. Groups F01L 15/00 - F01L 31/00 cover:
   - valve drive 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.
2. Groups F01L 15/00 - F01L 31/00 do not fully cover subject matter restricted to rotary, oscillatory, or lift-valve gear or valve arrangements, which is covered by group F01L 33/00 or F01L 35/00.

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, tripping-gear or tripping of valves F01L 31/00)
15/02 . with valves other than cylindrical, sleeve, or part-annularly-shaped, e.g. flat D-valves
15/04 . . main valve being combined with auxiliary valve (of drag valve type F01L 15/10)
15/06 . . . of Meyer or Rider type, i.e. in which the expansion is varied at the expansion valve itself
15/08 . with cylindrical, sleeve, or part-annularly-shaped valves; Such main valves combined with auxiliary valves
15/10 . with main slide valve and auxiliary valve dragged thereby
15/12 . characterised by having means for effecting pressure equilibrium between two different cylinder spaces at idling
15/14 . Arrangements with several co-operating main valves, e.g. reciprocatory and rotary
15/16 . . with reciprocatory slide valves only
15/18 . Valves arrangements not provided for in preceding subgroups of this main group
15/20 . Component parts, details, or accessories, not provided for in preceding subgroups of this main group

17/00 **Slide valve-gear or valve arrangements with cylindrical, sleeve, or part annularly-shaped valves surrounding working cylinder or piston**
17/02 . Drive or adjustment during operation, peculiar thereto, e.g. for reciprocating and oscillating movements or for several valves one inside the other

19/00 **Slide valve-gear or valve arrangements with reciprocatory and other movement of same valve, other than provided for in F01L 17/00, e.g. longitudinally of working cylinder and in cross direction**
19/02 . Drive or adjustment during operation, peculiar thereto

21/00 **Use of working pistons or pistons-rods as fluid-distributing valves or as valve-supporting elements, e.g. in free-piston machines**
21/02 . Piston or piston-rod used as valve 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**

25/00 **Drive, or adjustment during the operation, or distribution or expansion valves by non-mechanical means**
25/02 . by fluid means
25/04 . . by working-fluid of machine or engine, e.g. free-piston machine
25/06 . . . Arrangements with main and auxiliary valves, at least one of them being fluid-driven
25/063 . . . . {the auxiliary valve being actuated by the working motor-piston or piston-rod}
25/066 . . . . {piston or piston-rod being used as auxiliary valve}
25/08 . by electric or magnetic means

27/00 **Distribution or expansion valve-gear peculiar to free-piston machines or engines and not provided for in F01L 21/00 - F01L 25/00**
27/02 . the machine or engine having rotary or oscillatory valves
27/04 . Delayed-action controls, e.g. of cataract or dashpot type

29/00 **Reversing-gear**
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 25/04)

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-gears with eccentric drive
31/16 . . the drive being effected by specific means other than eccentric, e.g. cams; Valve adjustment in connection with such drives
31/18 . . specially for rotary or oscillatory valves

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

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)
35/02 . Valves
35/04 . Arrangements of valves in the machine or engine, e.g. relative to working cylinder

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2201/00 **Electronic control systems; Apparatus or methods therefor**

2250/00 **Camshaft drives characterised by their transmission means**
2250/02 . the camshaft being driven by chains
2250/04 . the camshaft being driven by belts
2250/06 . the camshaft being driven by gear wheels

2301/00 **Using particular materials**
2301/02 . Using ceramic materials

2303/00 **Manufacturing of components used in valve arrangements**
2303/01 . Tools for producing, mounting or adjusting, e.g. some part of the distribution
2303/02 . Initial camshaft settings

2305/00 **Valve arrangements comprising rollers**
2305/02 . Mounting of rollers

2307/00 **Preventing the rotation of tappets**

2309/00 **Self-contained lash adjusters**

2311/00 **Differential gears located between crankshafts and camshafts for varying the timing of valves**

2313/00 **Rotary valve drives**

2710/00 **Control of valve gear, speed or power**
2710/003 . Control of valve gear for two stroke engines
2710/006 . Safety devices therefor

2740/00 **Control of slide-valve gear; Control pistons**
2740/003 . more than one slide-valve, e.g. for four stroke engines
2740/006 . more than one slide-valve, e.g. for two stroke engines

2750/00 **Control of valve gear for four stroke engines directly driven by the crankshaft**

2760/00 **Control of valve gear to facilitate reversing, starting, braking of four stroke engines**
2760/001 . for starting four stroke engines
2760/002 . for reversing or starting four stroke engines
2760/003 . for switching to compressor action in order to brake
2760/004 . . whereby braking is exclusively produced by compression in the cylinders
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
2760/006 . for reversing two stroke engines
2760/007 . for starting two stroke engines
2760/008 . for reversing and restarting two stroke engines

2800/00 **Methods of operation using a variable valve timing mechanism**
2800/01 . Starting
2800/02 . Cold running
2800/03 . Stopping; Stalling
2800/04 . Timing control at idling
2800/05 . Timing control under consideration of oil condition
2800/06 . Timing or lift different for valves of same cylinder
2800/08 . Timing or lift different for valves of different cylinders
2800/09 . Calibrating
2800/10 . Providing exhaust gas recirculation [EGR]
2800/11 . Fault detection, diagnosis
2800/12 . Fail safe operation
2800/13 . Throttleless
2800/14 . Determining a position, e.g. phase or lift
2800/15 . Balancing of rotating parts
2800/16 . Preventing interference
2800/17 . Maintenance; Servicing
2800/18 . Testing or simulation
2800/19 . Valves opening several times per stroke

2810/00 **Arrangements solving specific problems in relation with valve gears**
2810/01 . Cooling
2810/02 . Lubrication

2810/03 . Reducing vibration
2810/04 . Reducing noise
2810/05 . Related to pressure difference on both sides of a valve

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