

## F01L

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

#### Definition statement

*This place covers:*

Valve-gear or valve arrangements, e.g. lift-valve gear;

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;

Slide valve-gear or valve-arrangements;

Valve-gear or valve arrangements actuated non-mechanically;

Valve arrangements in working piston or piston-rod;

Modifications of valve-gear to facilitate reversing, braking, starting, changing compression ratio, or other specific operations;

Valve-gear or valve arrangements, e.g. with reciprocating slide valves, other than provided for in groups;

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

Slide valve-gear or valve arrangements with reciprocating and other movement of same valve, e.g. longitudinally of working cylinder and in cross direction

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

Valves controlled by impact by piston, e.g. in free-piston machines; Drive, or adjustment during the operation, or distribution or expansion valves by non-mechanical means;

Distribution or expansion valve-gear peculiar to free-piston machines or engines;

Reversing gear Valve drive, valve adjustment during operation;

Rotary or oscillatory slide valve-gear or valve arrangements, specially adapted for machines or engines with variable fluid distribution;

Lift valve-gear or valve arrangements specially adapted for machines or engines with variable fluid distribution

In this subclass [F01L](#) the terms "for machines or engines" are used with the meanings: "engine" means a device for continuously converting fluid energy into mechanical power; thus this term includes, for example steam piston engines or steam turbine or internal combustion engines; "machine" means a device which could equally be an engine and a pump, and not a device which is restricted to an engine or one which is restricted to a pump.

#### References

##### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

In machines or engines in general, control of working-fluid admission or discharge peculiar thereto	<a href="#">F01B 3/10</a> , <a href="#">F01B 15/06</a>
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In rotary-piston machines or engines, control of working-fluid admission or discharge	<a href="#">F01C 2021/12</a>
In internal-combustion aspects of rotary-piston engines, valve control therefor	<a href="#">F02B 53/06</a>
In positive-displacement engines driven by liquids, distributing valve-gear peculiar thereto	<a href="#">F03C 1/08</a>
In positive displacement machines or pumps, self-acting distribution members	<a href="#">F04B 1/18</a>
In positive displacement machines or pumps positively-driven distribution members	<a href="#">F04B 7/00</a>
In positive displacement machines or pumps, actuation of distribution members	<a href="#">F04B 39/08</a>
In positive displacement machines or pumps, adaptation or arrangements of distribution members	<a href="#">F04B 39/10</a>
In rotary-piston pumps for liquid, control of working-fluid admission or discharge	<b>F04C15/02</b>
In rotary-piston pumps for elastic fluids, control of working-fluid admission or discharge	<b>F04C29/08</b>

## 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](#))**

### Definition statement

*This place covers:*

Valve drive units, e.g. transmission between crankshaft and camshaft, camshaft arrangements, cam followers, camshaft phasers.

### References

#### Limiting references

*This place does not cover:*

Valve-gear specially for steam engines or specially for other machines or engines with variable fluid distribution	<a href="#">F01L 15/00- F01L 35/00</a>
Valve arrangements in general	<a href="#">F16K</a>

#### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Lift-valve and valve-seat assemblies per se	<a href="#">F01L 3/00</a>
Slide-valve gear	<a href="#">F01L 5/00</a>
Actuated non-mechanically	<a href="#">F01L 9/00</a>
Valve arrangements in working piston or piston rod	<a href="#">F01L 11/00</a>

Modifications of valve-gear to facilitate reversing, braking, starting, changing compression ratio, or other specific operations	<a href="#">F01L 13/00</a>
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## F01L 1/02

Valve drive (transmitting-gear between valve drive and valve [F01L 1/12](#))

### References

#### *Informative references*

*Attention is drawn to the following places, which may be of interest for search:*

Camshaft drives indexed according to their transmission means -chain, belt, gear wheel:	<a href="#">F01L 1/00</a> , <a href="#">F01L 1/02</a> , <a href="#">F01L 1/04</a> , <a href="#">F01L 1/06</a>
Transmitting-gear between valve drive and valve	<a href="#">F01L 1/12</a>
Auxiliary apparatus of engines driven by means of chains, belts or like endless members:	<a href="#">F02B 67/04</a> , <a href="#">F02B 67/06</a>
Safety means relating to endless members:	<a href="#">F02B 77/081</a>
Driving belts, driving chains:	<a href="#">F16G 1/00</a> , <a href="#">F16G 13/00</a>
Gearings for conveying rotary motion by endless flexible members:	<a href="#">F16H 7/00</a>
Means for tensioning:	<a href="#">F16H 7/02</a> , <a href="#">F16H 7/08</a>

## F01L 1/022

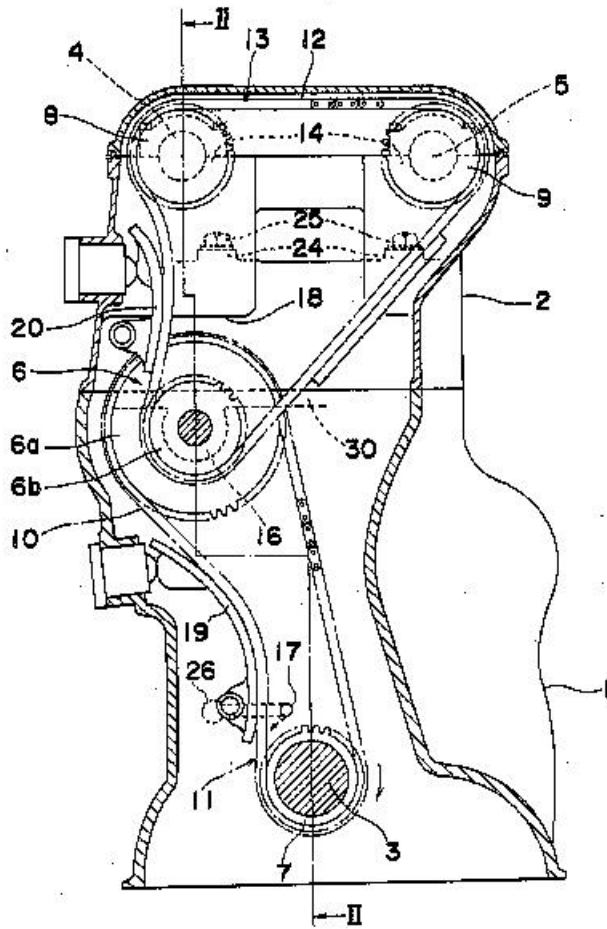
{Chain drive}

### Definition statement

*This place covers:*

Illustrative example

US4750455



**References**

**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Gearings for conveying rotary motion with chains	<a href="#">F16H 7/06</a>
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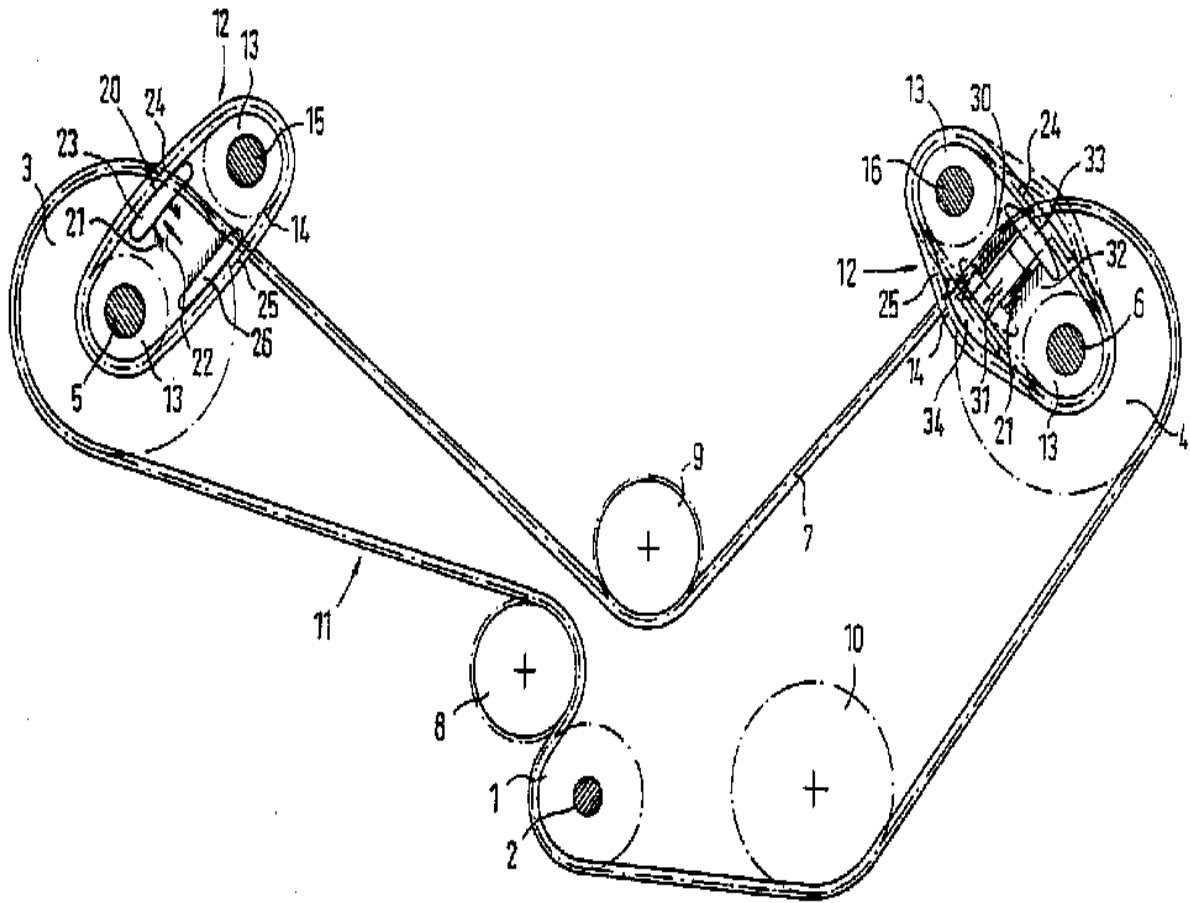
**F01L 1/024**

{Belt drive}

**Definition statement**

This place covers:  
 Illustrative example

US4716864



**References**

**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Gearings for conveying rotary motion with belts	<a href="#">F16H 7/02</a>
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**F01L 1/026**

{Gear drive}

**Definition statement**

This place covers:

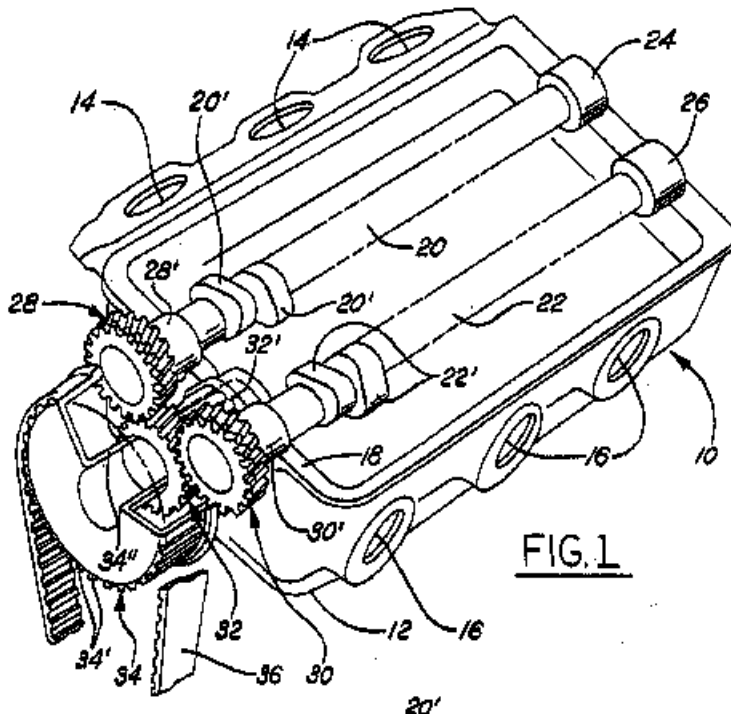
Illustrative example

US5598630

U.S. Patent

Feb. 4, 1997

5,598,630



**F01L 1/047**

**Camshafts**

**References**

**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Manufacturing by shaping with fluid pressure	<a href="#">B21D 26/02</a>
Manufacturing camshafts	<a href="#">B21D 53/845.</a>
Machining camshafts	<a href="#">B23B 41/00</a>
Connecting cams to shaft	<a href="#">B23P 11/00</a>
By expanding and then shrinking	<a href="#">B23P 11/02</a>
Using pressure fluids	<a href="#">B23P 11/022</a>
Using heat or cold	<a href="#">B23P 11/025</a>
Grinding	<a href="#">B24B 19/12</a>
Lubrication of camshaft bearings	<a href="#">F01M 9/102</a>
Rigidly coupling two coaxial shafts involving plastic deformation	<a href="#">F16D 1/072</a>
Camshafts with single track cams	<a href="#">F16H 53/02</a>
Characterised by their construction	<a href="#">F16H 53/025</a>

**F01L 1/053****overhead type****References*****Informative references***

*Attention is drawn to the following places, which may be of interest for search:*

Single overhead camshafts (SOHC)	<a href="#">F01L 2001/0535</a>
Double overhead camshafts (DOHC)	<a href="#">F01L 2001/0537</a>
Camshaft in cylinder block	<a href="#">F01L 2001/054</a>

**F01L 1/08****Shape of cams****References*****Informative references***

*Attention is drawn to the following places, which may be of interest for search:*

Cams as part of gearings in general	<a href="#">F16H 53/00</a>
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**F01L 1/10**

by means of crank-or eccentric-driven rods {(F01L 1/044 takes precedence)}

**Definition statement**

*This place covers:*

Illustrative example

WO 00/09868

2/8

PCT/IB98/01620

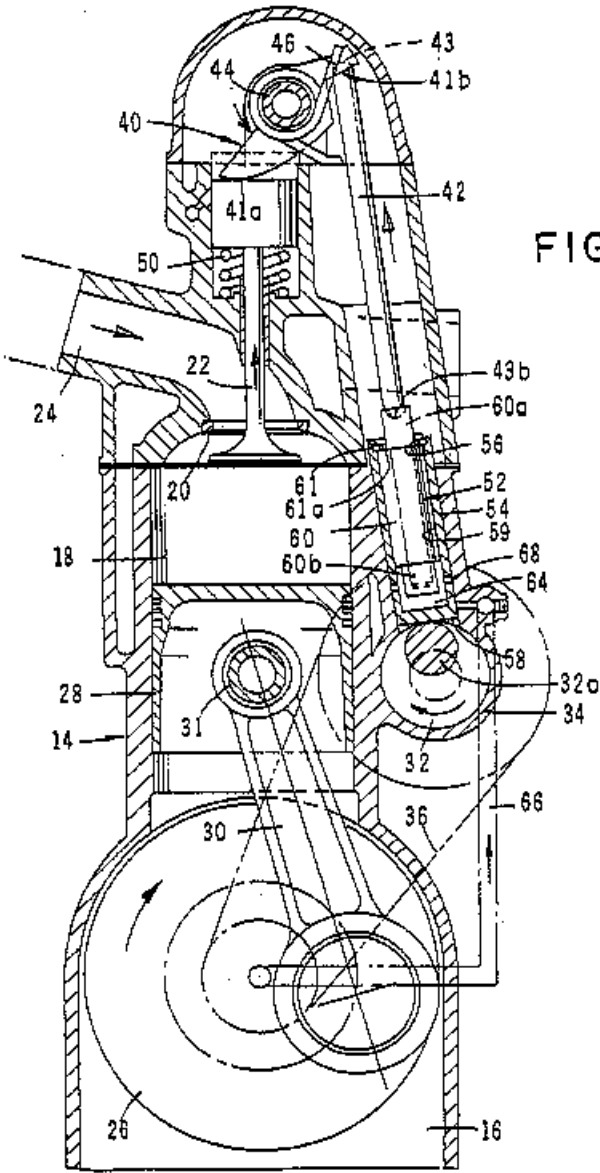


FIG. 1



## F01L 1/12

Transmitting gear between valve drive and valve (simultaneously operating two or more valves [F01L 1/26](#))

### References

#### Informative references

Attention is drawn to the following places, which may be of interest for search:

Valve arrangement comprising rollers	<a href="#">F01L 2105/00</a> , <a href="#">F01L 2105/02</a>
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## F01L 1/14

Tappets {(hydraulic tappets for automatically adjusting or compensating clearance [F01L 1/24](#))}; Push rods

### References

#### Informative references

Attention is drawn to the following places, which may be of interest for search:

Preventing the rotation of tappet	<a href="#">F01L 2107/00</a>
Lubrication of tappets	<a href="#">F01M 9/104</a>
Tappets for fuel pump	<a href="#">F02M 59/102</a>

## F01L 1/18

Rocking arms or levers

### References

#### Informative references

Attention is drawn to the following places, which may be of interest for search:

Split rocking arms	<a href="#">F01L 2001/186</a>
Clips for retaining rocker arm on pivot	<a href="#">F01L 2001/187</a>
Fulcrums at upper surface	<b>F01L1/18G</b>
Manufacturing	<a href="#">B21K 1/205</a> , <a href="#">B21D 53/84</a>

**F01L 1/181**

{Centre pivot rocking arms}

**Definition statement**

*This place covers:*

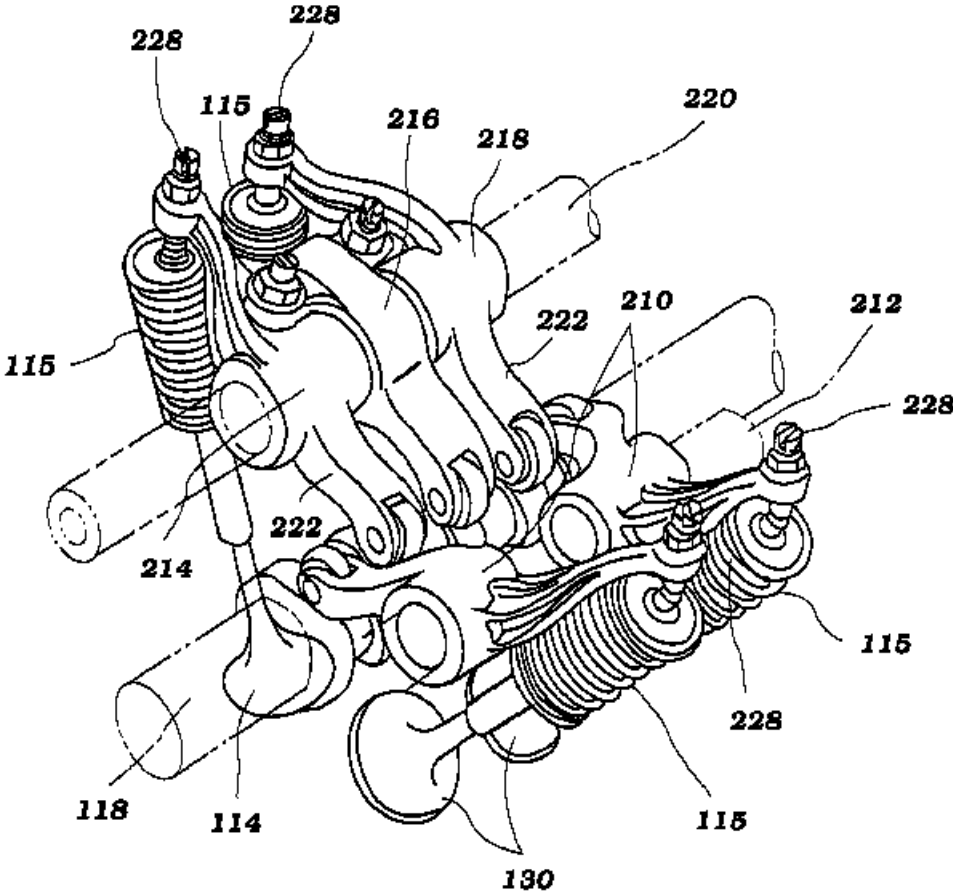
Illustrative example

**U.S. Patent**

Mar. 16, 2004

Sheet 4 of 8

**US 6,705,264 B2**



**F01L 1/182**

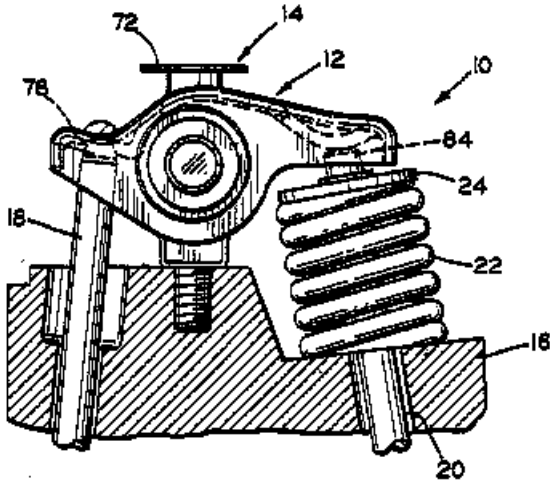
{the rocking arm being pivoted about an individual fulcrum, i.e. not about a common shaft}

**Definition statement**

*This place covers:*

Illustrative example

**U.S. Patent**      **Nov. 12, 1991**      **Sheet 1 of 2**      **5,063,889**



**F01L 1/183**

{of the boat type}

**Definition statement**

*This place covers:*

Illustrative example

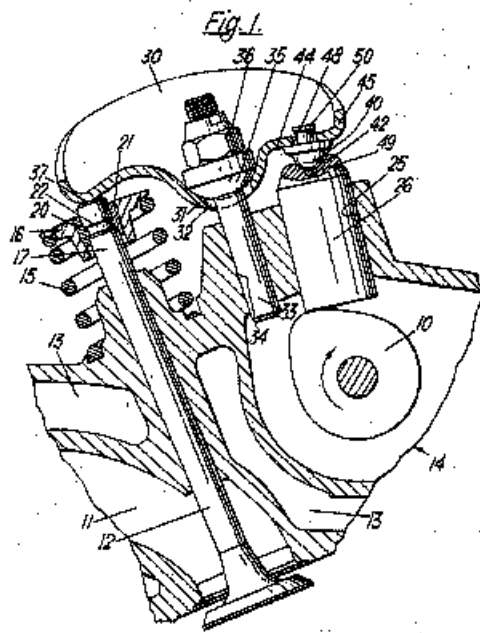
Feb. 7, 1967

C. B. LEACH

3,302,628

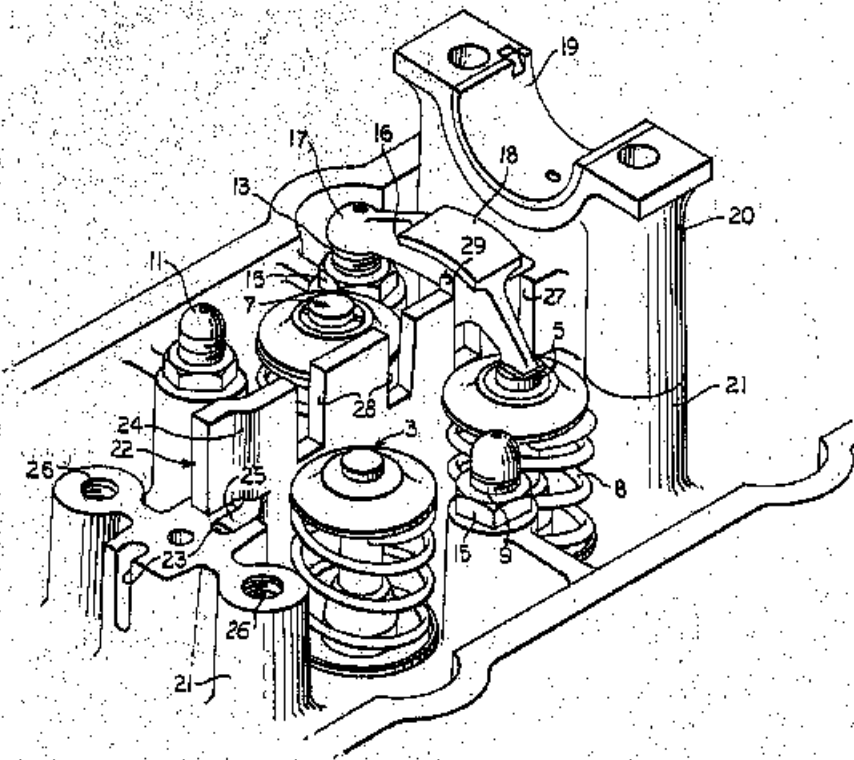
INTERNAL COMBUSTION ENGINE VALVE GEAR

Filed Dec. 21, 1965



**F01L 1/185****{Overhead end-pivot rocking arms}****Definition statement***This place covers:*

Illustrative example

**Patented Feb. 16, 1971****3,563,215****F01L 1/24****by fluid means, e.g. hydraulically****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Self-contained lash adjusters

[F01L 2109/00](#)

**F01L 1/32**

characterised by the provision of means for rotating lift valves, e.g. to diminish wear

**References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

Arrangements for valve movement other than for opening or closing e.g. grinding-in, preventing sticking	<a href="#">F16K 29/00</a>
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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}

**References****Limiting references**

This place does not cover:

Means for changing valve lift, which thereby change the timing of opening and the timing of closing	<a href="#">F01L 13/00</a> , <a href="#">F01L 13/0015</a>
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**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Modifying distribution valve timing	<a href="#">F02B 29/08</a>
Coupling of coaxial shafts for variable angular relationship	<a href="#">F16D 3/10</a>
Gearing for varying phase	<a href="#">F16H 35/008</a>

**F01L 1/344**

changing the angular relationship between crankshaft and camshaft, e.g. using helicoidal gear

**References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

Yielding couplings with means for varying the angular relationship of two coaxial shafts during motion	<a href="#">F16D 3/10</a>
Gearings for variation of rotational phase between input and output shaft	<a href="#">F16H 35/008</a>

**F01L 1/34403**

{using helically teathed sleeve or gear moving axially between crankshaft and camshaft}

**Definition statement**

*This place covers:*

Illustrative example

**U.S. Patent**      **June 23, 1992**      **Sheet 3 of 4**      **5,123,388**

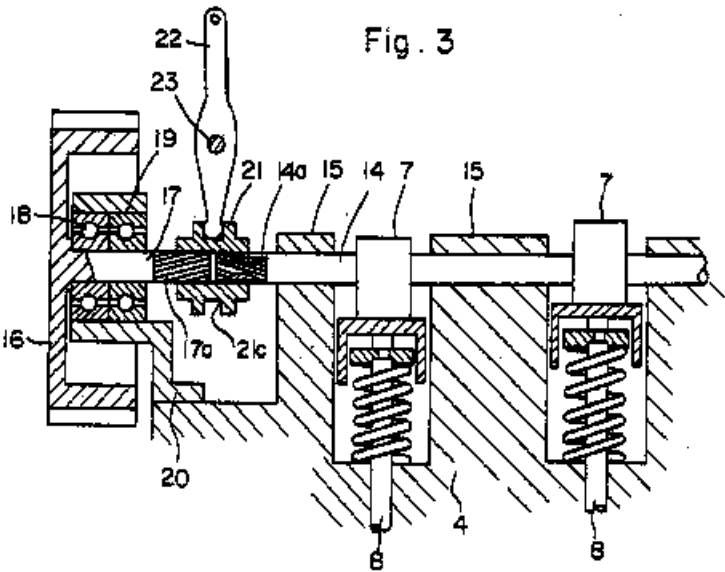


Fig. 3

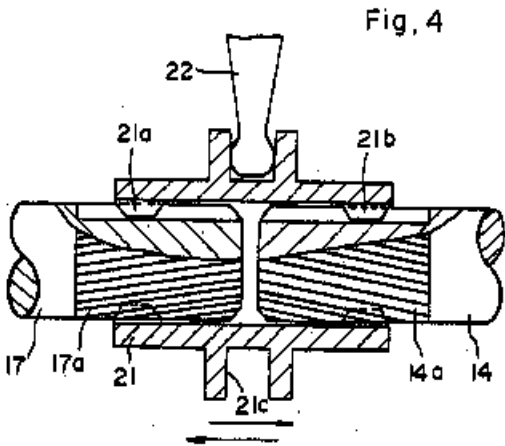


Fig. 4

**F01L 1/34406**

{the helically teathed sleeve being located in the camshaft driving pulley}

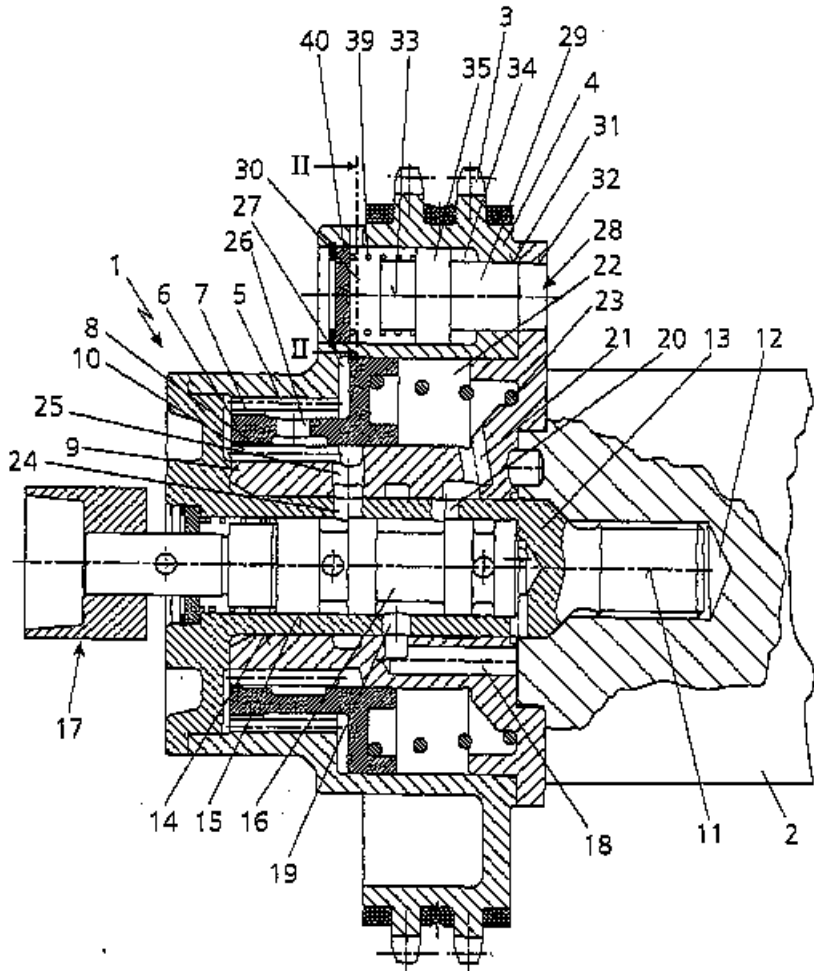
**Definition statement**

*This place covers:*

Illustrative example

ZEICHNUNGEN SEITE 1

Nummer: DE 100 06 349 A1  
Int. Cl.?: F01L 1/344  
Offenlegungstag: 30. August 2001



**F01L 1/34413**

{using composite camshafts, e.g. with cams being able to move relative to the camshaft}

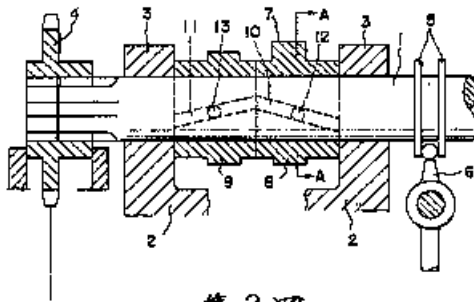
**Definition statement**

*This place covers:*

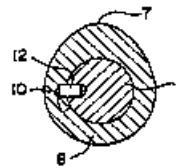
Illustrative example



JP59183009 A



第 2 圖



## References

### Informative references

Attention is drawn to the following places, which may be of interest for search:

composite camshafts	<a href="#">F01L 2001/0473</a>
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## F01L 1/34416

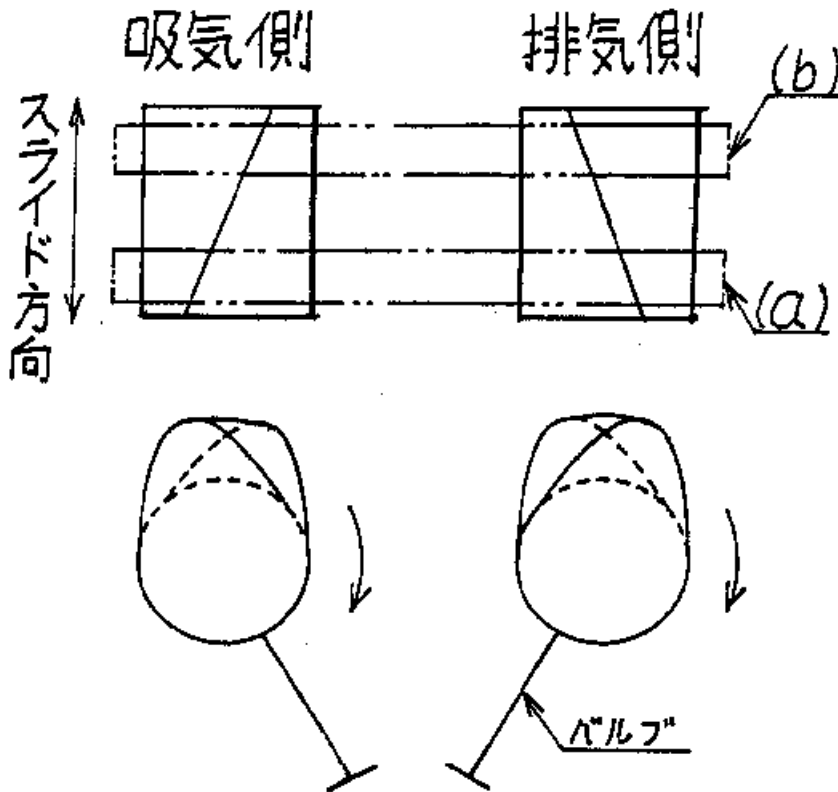
{using twisted cams}

### Definition statement

*This place covers:*

Illustrative example

JP61104112 A



**References**

**Limiting references**

*This place does not cover:*

If axial displacement of a three-dimensional cam modifies beyond the opening/closing timing also the valve lift	<a href="#">F01L 2013/0078</a>
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**F01L 1/3442**

{using hydraulic chambers with variable volume to transmit the rotating force}

**Definition statement**

*This place covers:*

Illustrative example

DE19745908 A

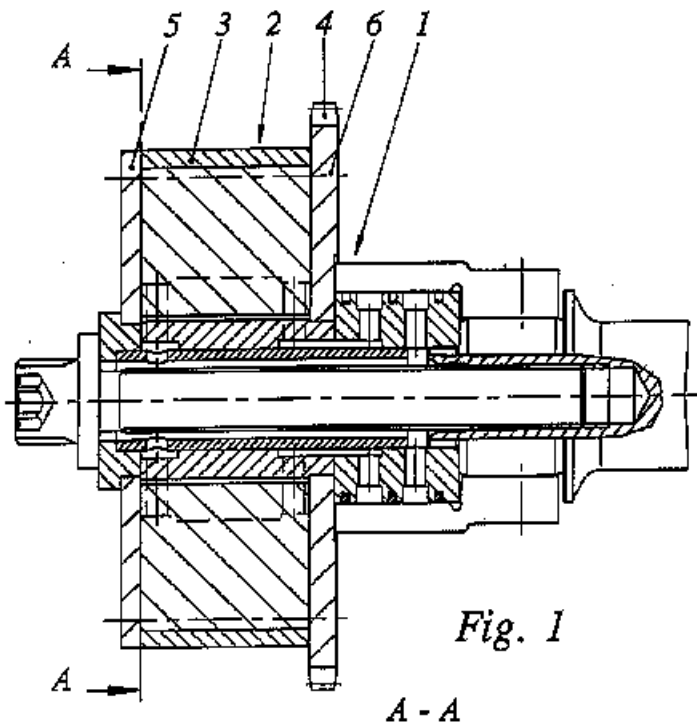


Fig. 1

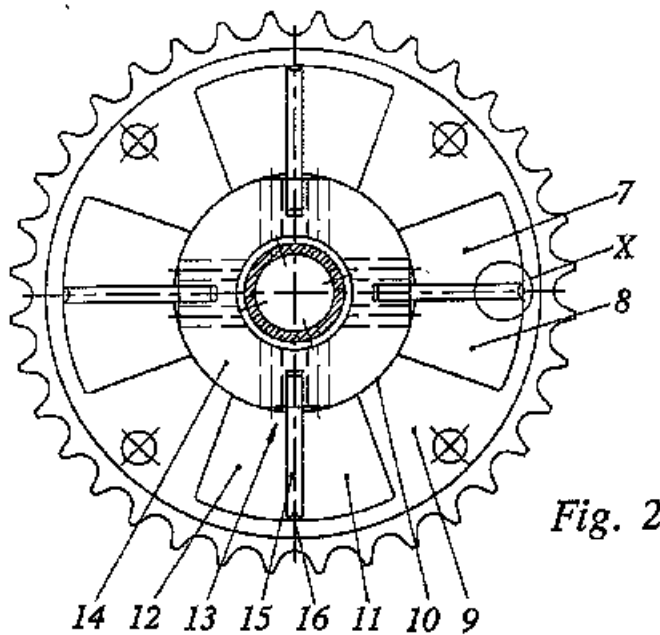


Fig. 2

**References**

**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Details of servo motor systems for spool valves	<a href="#">F15B 13/0402</a>
oil control valves such as spool valves in general	<a href="#">F16K 11/00</a>
solenoid actuated control valves	<a href="#">F16K 31/06,</a> <a href="#">F15B 13/0442</a>
solenoid aspects of the spool valve actuator	<a href="#">H01F 7/16</a>

**F01L 1/348**

by means acting on timing belts or chains

**Definition statement**

*This place covers:*

Illustrative example

EP 0 551 592 A1

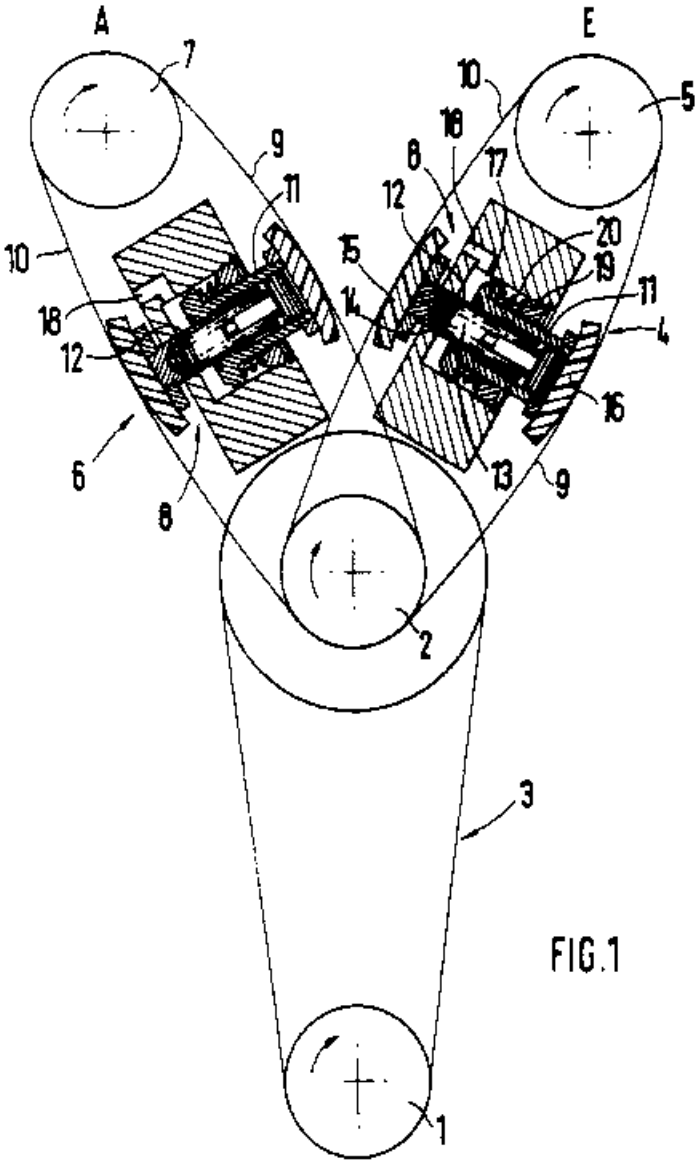


FIG.1

**References**

**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Means for varying tension of belts, ropes or chains	<a href="#">F16H 7/08</a>
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**F01L 1/352**

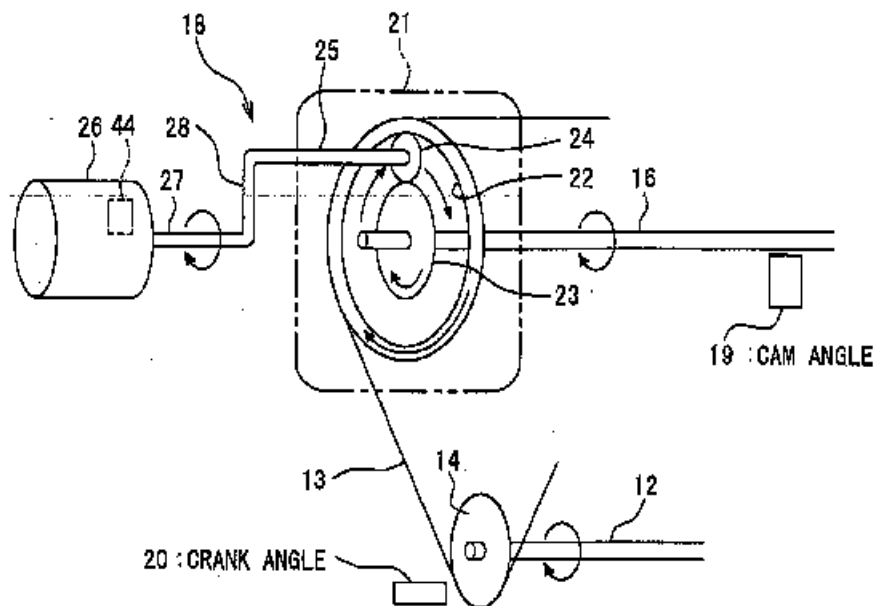
using bevel or epicyclic gear

**Definition statement***This place covers:*

Illustrative example

Patent Application Publication Mar. 2, 2006 Sheet 2 of 4

US 2006/0042578 A1

**FIG. 2****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Differential gears between crankshaft and camshaft(s) for varying timing	<a href="#">F01L 2111/00</a>
Gears with orbital motion	<a href="#">F16H 1/321</a>
Wave gearings, harmonic drive transmission	<a href="#">F16H 49/001</a>

**F01L 3/00**

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

**References****Limiting references***This place does not cover:*

Valve-gear specially for steam engines or specially for other machines or engines with variable fluid distribution	<a href="#">F01L 15/00- F01L 35/00</a>
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Valves for specific use as Exhaust Gas Recirculation valves (EGR valves) s	<a href="#">F02M 26/52</a>
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### **Informative references**

Attention is drawn to the following places, which may be of interest for search:

Finishing, reconditioning valves:	<a href="#">B23C 3/05</a>
Making poppet valves:	<a href="#">B23P 15/002</a> ; <a href="#">B21K 1/22</a> ;

## **F01L 5/00**

**Slide valve-gear or valve-arrangements (with pure rotary or oscillatory movement [F01L 7/00](#))**

### **References**

#### **Limiting references**

*This place does not cover:*

Valve-arrangements with pure rotary or oscillatory movement	<a href="#">F01L 7/00</a>
Valve-gear specially for steam engines or specially for other machines or engines with variable fluid distribution	<a href="#">F01L 15/00- F01L 35/00</a>

## **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](#))**

### **References**

#### **Limiting references**

*This place does not cover:*

Slide valves with combined rotary and non-rotary movements, combinations of rotary and non-rotary slide valves	<a href="#">F01L 5/00</a>
Valve-gear specially for steam engines or specially for other machines or engines with variable fluid distribution	<a href="#">F01L 15/00- F01L 35/00</a>

### **Informative references**

Attention is drawn to the following places, which may be of interest for search:

Rotary valve drives:	<a href="#">F01L 2113/00</a>
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**F01L 9/00****Valve-gear or valve arrangements actuated non-mechanically****References****Limiting references**

*This place does not cover:*

Valve-gear specially for steam engines or specially for other machines or engines with variable fluid distribution	<a href="#">F01L 15/00- F01L 35/00</a>
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**F01L 9/02****by fluid means, e.g. hydraulic****References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

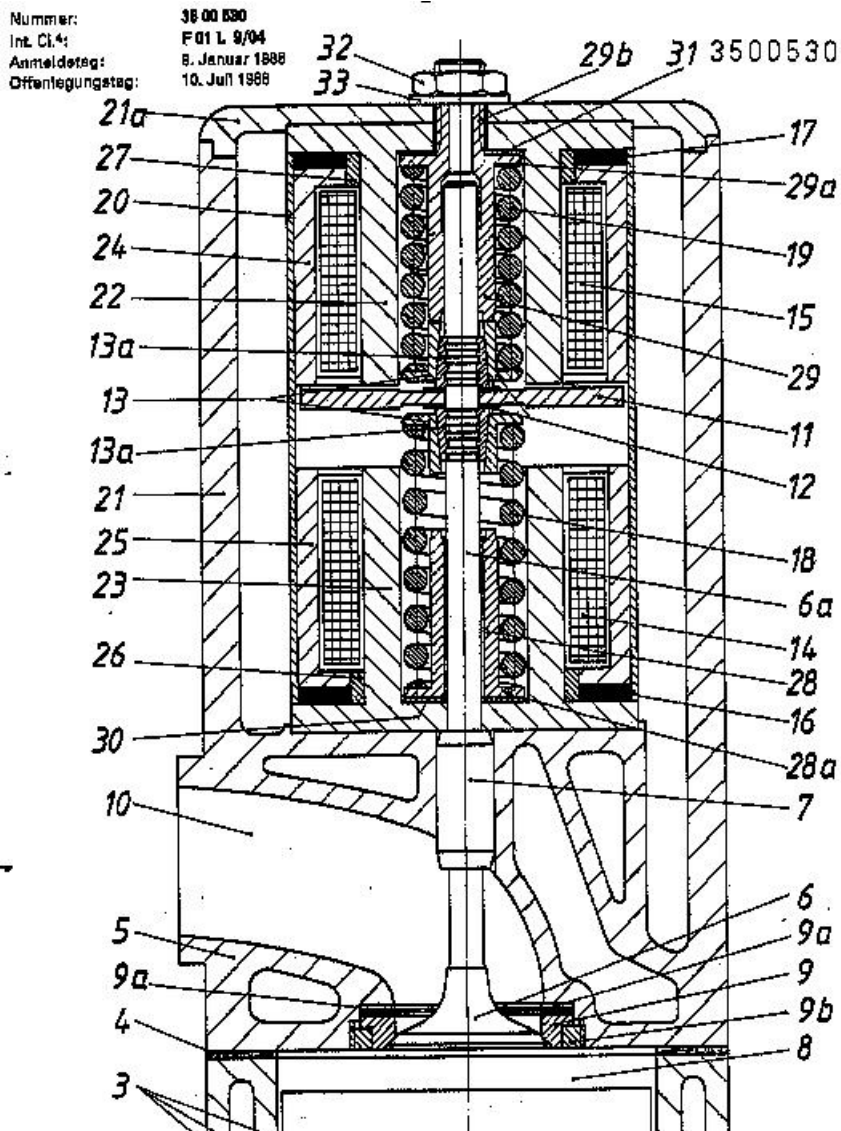
Boost means	<b>F01L9/02E</b>
Fluid pressure actuators	<a href="#">F15B 13/00</a>

**F01L 9/04****by electric means****Definition statement**

*This place covers:*

Illustrative example

DE3500530:



**References**

**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Electric actuating device, using motor	<a href="#">F16K 31/02</a> , <a href="#">F16K 31/04</a> , <a href="#">F16K 31/06</a> , <a href="#">F16K 31/08</a>
Pivoting, rectilinear armature, using motor	<a href="#">H01F 7/14</a> , <a href="#">H01F 7/16</a> , <a href="#">H01F 7/17</a>
Linear motor	<a href="#">H02K 41/00</a>



## F01L 11/00

### Valve arrangements in working piston or piston-rod

#### References

##### Limiting references

*This place does not cover:*

Valve-gear specially for steam engines or specially for other machines or engines with variable fluid distribution	<a href="#">F01L 15/00- F01L 35/00</a>
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## F01L 13/00

### Modifications of valve-gear to facilitate reversing, braking, starting, changing compression ratio, or other specific operations

#### References

##### Limiting references

*This place does not cover:*

Valve-gear specially for steam engines or specially for other machines or engines with variable fluid distribution	<a href="#">F01L 15/00- F01L 35/00</a>
Methods of controlling engine output power by varying valve lift and timing of inlet resp. exhaust valve(s), for which the emphasis is not on the structure of the valve gear used	<a href="#">F02D 13/00</a> , <a href="#">F02D 13/02</a> , <a href="#">F02D 13/04</a> , <a href="#">F02D 13/06</a> , <a href="#">F02D 13/08</a> , <a href="#">F02D 15/00</a>

##### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Controlling engine output power by varying valve lift and timing of inlet resp. exhaust valve(s):	<a href="#">F02D 13/00</a> ;
Internal EGR	<a href="#">F02M 26/01</a>

## F01L 13/0005

### {Deactivating valves}

#### Definition statement

*This place covers:*

Structure of valve drive switchable to a valve deactivating mode for lost motion of the cam follower, e.g. two-part cam followers with switchable locking means there between.

#### References

##### Limiting references

*This place does not cover:*

Methods of controlling engines by rendering engine inoperative or idling or by cutting out individual cylinders, for which the emphasis is not on the structure of the valve gear used	<a href="#">F02D 17/00</a>
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Cutting-out	<a href="#">F02D 17/02</a>
Inoperative or idling	<a href="#">F02D 17/04</a>

## F01L 13/06

### for braking

#### Definition statement

*This place covers:*

Structure of valve drive switchable to an engine braking mode, e.g. actuator opening exhaust valve for compression release event or cam follower switchable to a configuration to transmit to the valve the lift of a cam braking lobe.

#### References

##### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Control of valve gear for switching to compressor action for braking:	<a href="#">F01L 2760/003</a>
Braking being exclusively produced by compression in the cylinders:	<a href="#">F01L 2760/004</a> ;
In cooperation with vehicle transmission or brakes:	<a href="#">F01L 2760/005</a>
Engine brake with retarder:	<a href="#">B60W 10/18</a>
Control of engine for using engine as brake:	<a href="#">F02D 13/04</a>

## F01L 23/00

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

#### Definition statement

*This place covers:*

valves actuated by interference with the stroke of the piston, valves ballistically driven

## F01L 25/00

**Drive, or adjustment during the operation, or distribution or expansion valves**  
**by non-mechanical means**

#### Definition statement

*This place covers:*

Types of non-mechanical valve drives like for [F01L 9/00](#), but for steam engines

## F01L 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](#)**

### Definition statement

*This place covers:*

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

## 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](#) - [F01L 31/00](#))**

### Definition statement

*This place covers:*

Types of rotary or oscillatory slide valve arrangements like for [F01L 7/00](#), but for steam engines

### References

#### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Rotary or oscillatory slide valve-gear or valve arrangements for combustion engines	<a href="#">F01L 7/00</a>
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## 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](#) - [F01L 31/00](#))**

### Definition statement

*This place covers:*

Types of lift valve arrangements like for [F01L 3/00](#), but for steam engines

### References

#### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Lift valve arrangements for combustion engines	<a href="#">F01L 3/00</a>
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