F01B

MACHINES OR ENGINES, IN GENERAL OR OF POSITIVE-DISPLACEMENT TYPE, e.g. STEAM ENGINES (of rotary-piston or oscillating-piston type F01C; of non-positive-displacement type F01D; internal-combustion engines F02B; combustion-product engine plants F02G; machines or engines, other than of positive-displacement type, for liquids F03B; positive-displacement engines driven by liquids F03C; wind motors F03D; positive-displacement machines for liquids F04B; rotary-piston, or oscillating-piston, positive-displacement machines for liquids F04C)

Definition statement

This place covers:

Machines or engines, in general or of positive-displacement type.

References

Limiting references

This place does not cover:

Rotary-piston or oscillating-piston machines or engines	F01C
Non-positive-displacement machines or engines, e.g. steam turbines	F01D
Internal-combustion engines	F02B
Combustion-product engine plants	F02G
Machines or engines, other than of positive-displacement type, for liquids	F03B
Positive-displacement engines driven by liquids	F03C
Wind motors	F03D
Positive-displacement machines for liquids	F04B
Rotary-piston, or oscillating-piston, positive-displacement machines for liquids	F04C

Informative references

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

Steam engine plants	F01K
Cyclically operating valves for machines or engines	F01L
Lubricating of machines or engines in general	F01M
Pumps for liquids or elastic fluids	F04
Crankshafts, crossheads or connecting-rods	F16C
Flywheels	F16F
Gearings for interconverting rotary motion and reciprocating motion in general	F16H
Pistons, piston rods or cylinders, for engines in general	F16J

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

engine	a device for continuously converting fluid energy into mechanical power, thus, this term includes, for example, steam piston engines or steam turbines, per se, or internal-combustion piston engines, but it excludes single-stroke devices.
machine	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.
pump	a device for continuously raising, forcing, compressing, or exhausting fluid by mechanical or other means. Thus, this term includes fans or blowers.
positive displacement	the way the energy of a working fluid is transformed into mechanical energy, in which variations of volume created by the working fluid in a working chamber produce equivalent displacements of the mechanical member transmitting the energy, the dynamic effect of the fluid being of minor importance, and vice versa.
non-positive displacement	the way the energy of a working fluid is transformed into mechanical energy, by transformation of the energy of the working fluid into kinetic energy, and vice versa.
oscillating-piston machine	a positive-displacement machine in which a fluid-engaging work-transmitting member oscillates. This definition applies also to engines and pumps.
rotary-piston machine	a positive-displacement machine in which a fluid-engaging work-transmitting member rotates about a fixed axis or about an axis moving along a circular or similar orbit. This definition applies also to engines and pumps.
rotary piston	the work-transmitting member of a rotary-piston machine and may be of any suitable form, e.g., like a toothed gear.
free piston	a piston of which the length of stroke is not defined by any member driven thereby.
cylinders	positive-displacement working chambers in general. Thus, this term is not restricted to cylinders of circular cross-section.
main shaft	the shaft which converts reciprocating piston motion into rotary motion or vice versa.
plant	an engine together with such additional apparatus as is necessary to run the engine. For example, a steam engine plant includes a steam engine and means for generating the steam.
working fluid	the driven fluid in a pump or the driving fluid in an engine. The working fluid can be in a compressible, gaseous state, called elastic fluid, e.g. steam; in a liquid state; or in a state where there is coexistence of an elastic fluid and liquid phase.

F01B 1/00

Reciprocating-piston machines or engines characterised by number or relative disposition of cylinders or by being built-up from separate cylinder-crankcase elements (F01B 3/00, F01B 5/00 take precedence)

References

Limiting references

This place does not cover:

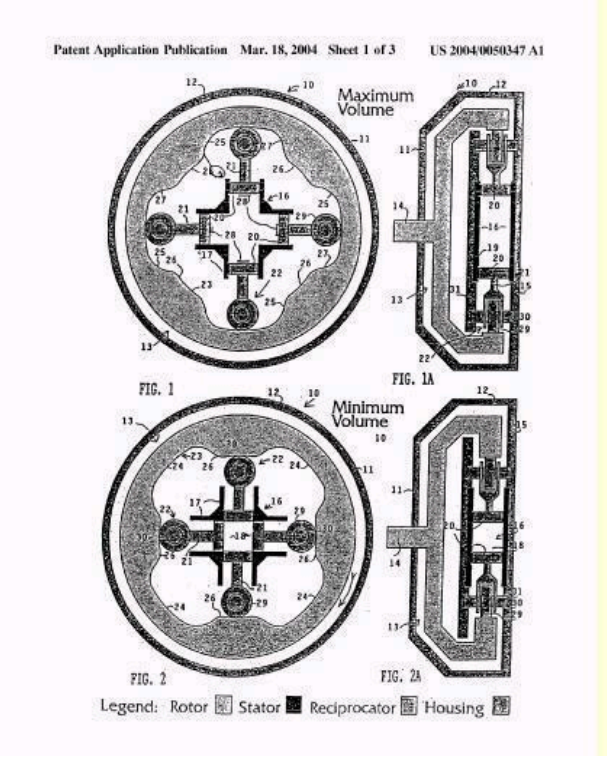
Reciprocating-piston machines or engines with cylinder axes coaxial with, or parallel or inclined to, main shaft	F01B 3/00
Reciprocating-piston machines or engines with cylinder axes arranged substantially tangentially to a circle centred on main shaft axis	F01B 5/00

F01B 1/0603

{the connection of the pistons with an element being at the outer ends of the cylinders}

Special rules of classification

Illustrative example of subject matter classified in F01B 1/0603

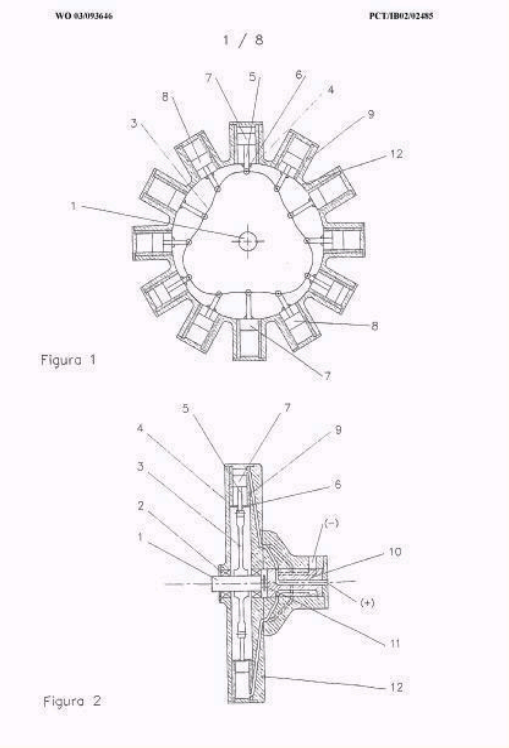


F01B 1/062

{the connection of the pistons with an actuating or actuated element being at the inner ends of the cylinders}

Special rules of classification

Illustrative example of subject matter classified in F01B 1/062



F01B 1/0665

{Disconnecting the pistons from the actuating or actuated cam}

References

Informative references

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

Disengagement of connections between pistons and main shafts	F01B 31/24

F01B 1/10

with more than one main shaft, e.g. coupled to common output shaft

References

Informative references

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

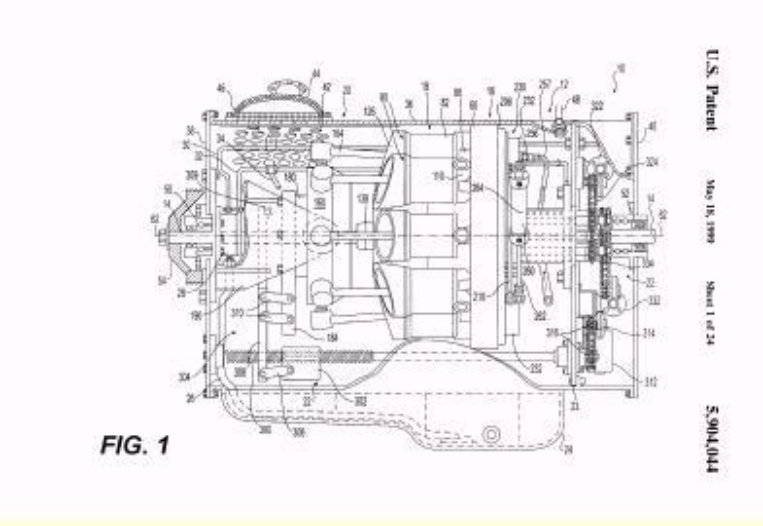
Combinations of two or more machines or engines	F01B 21/00

F01B 3/00

Reciprocating-piston machines or engines with cylinder axes coaxial with, or parallel or inclined to, main shaft axis

Special rules of classification

Illustrative example of subject matter classified in F01B 3/00

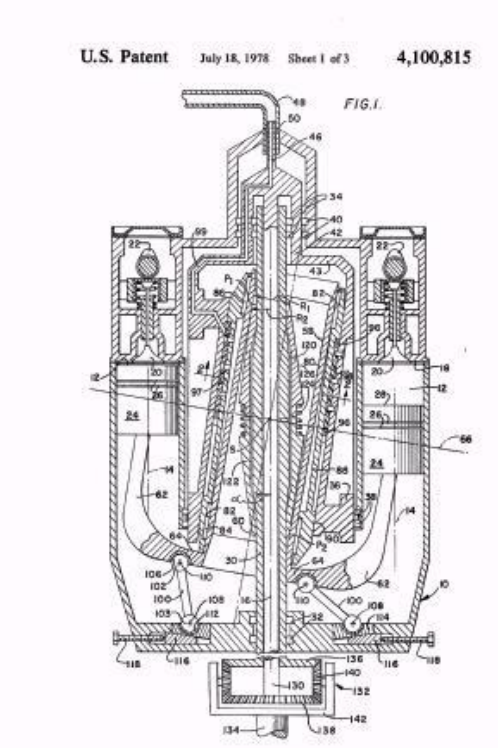


F01B 3/0002

{having stationary cylinders}

Special rules of classification

Illustrative example of subject matter classified in F01B 3/0002

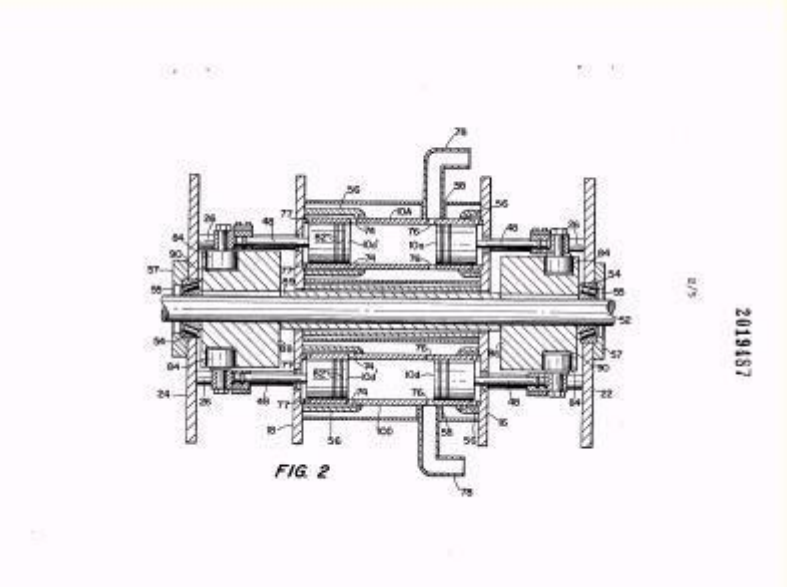


F01B 3/0005

{having two or more sets of cylinders or pistons}

Special rules of classification

Illustrative example of subject matter classified in F01B 3/0005

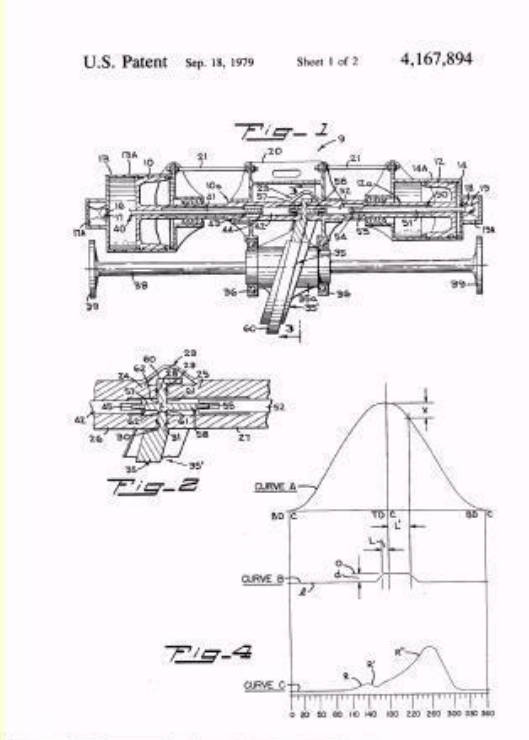


F01B 3/0008

{having self-acting distribution members, e.g. actuated by working fluid}

Special rules of classification

Illustrative example of subject matter classified in F01B 3/0008

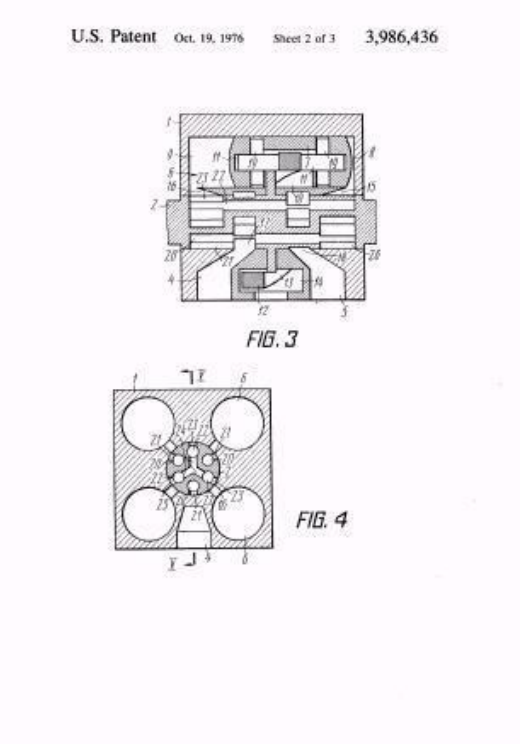


F01B 3/0011

{Cylindrical distribution members}

Special rules of classification

Illustrative example of subject matter classified in F01B 3/0011

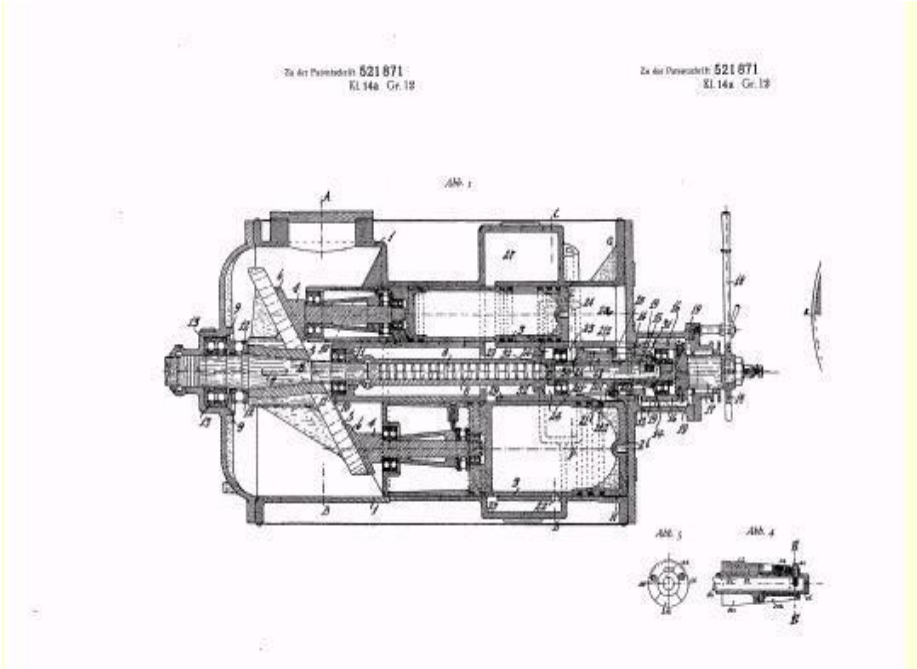


F01B 3/0014

{Conical distribution members}

Special rules of classification

Illustrative example of subject matter classified in F01B 3/0014

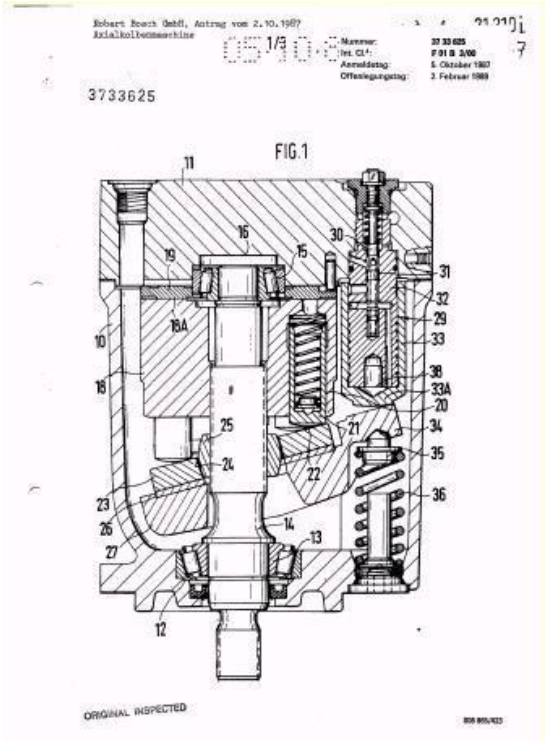


F01B 3/0032

{having rotary cylinder block}

Special rules of classification

Illustrative example of subject matter classified in F01B 3/0032

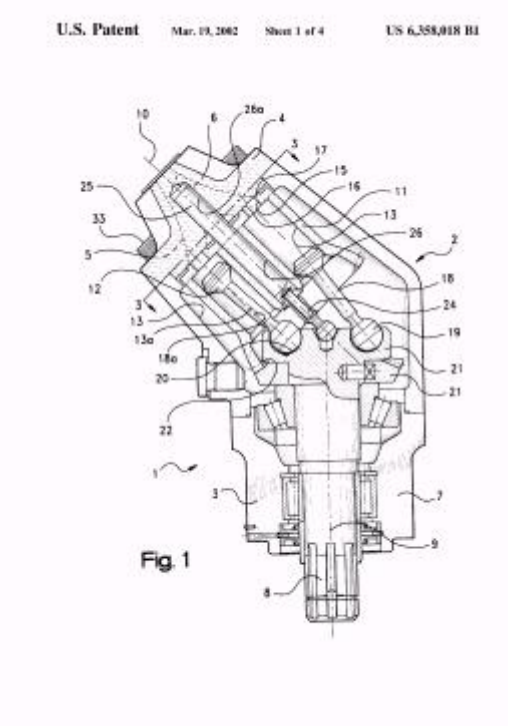


F01B 3/0038

{inclined to main shaft axis}

Special rules of classification

Illustrative example of subject matter classified in F01B 3/0038

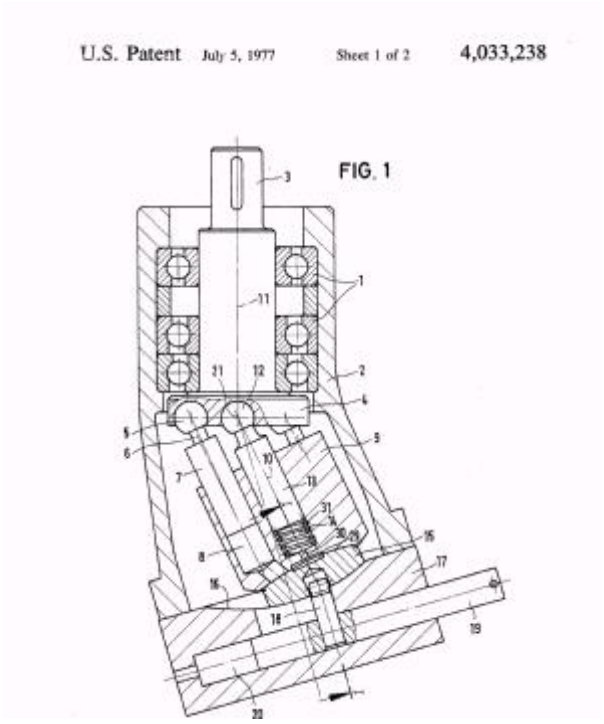


F01B 3/0041

{Arrangements for pressing the cylinder barrel against the valve plate, e.g. fluid pressure}

Special rules of classification

Illustrative example of subject matter classified in F01B 3/0041

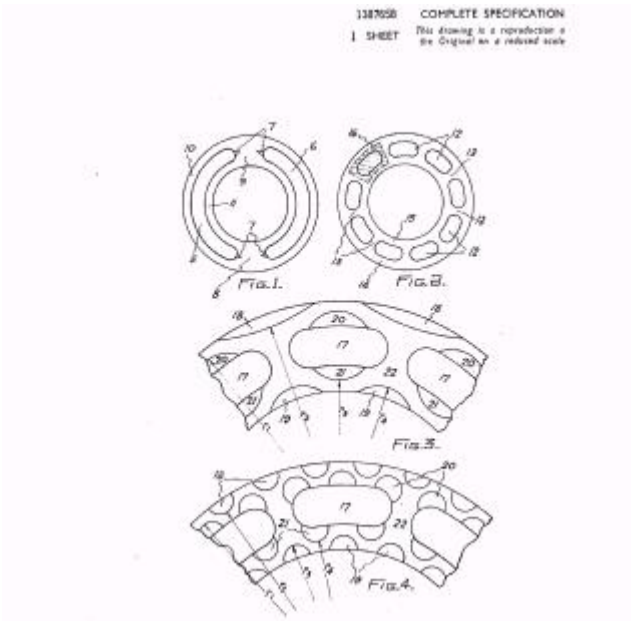


F01B 3/0047

{Particularities in the contacting area between cylinder barrel and valve plate}

Special rules of classification

Illustrative example of subject matter classified in F01B 3/0047

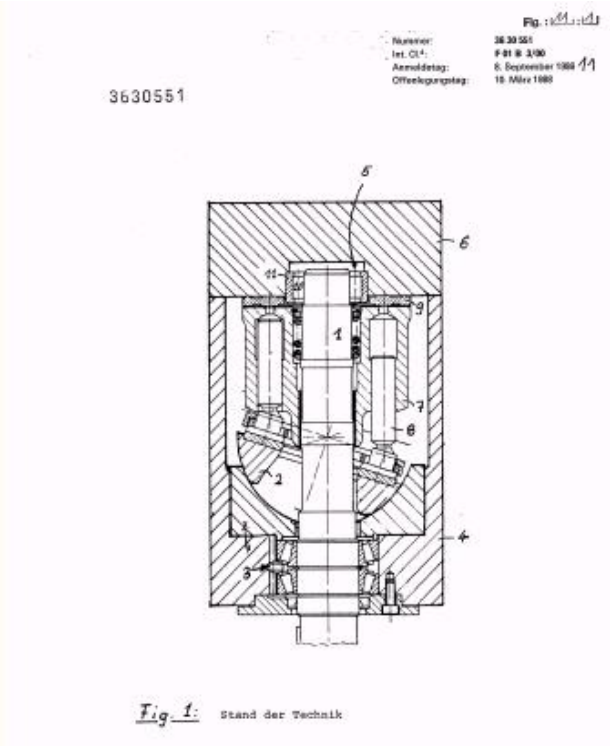


F01B 3/005

{Bearing arrangements}

Special rules of classification

Illustrative example of subject matter classified in F01B 3/005

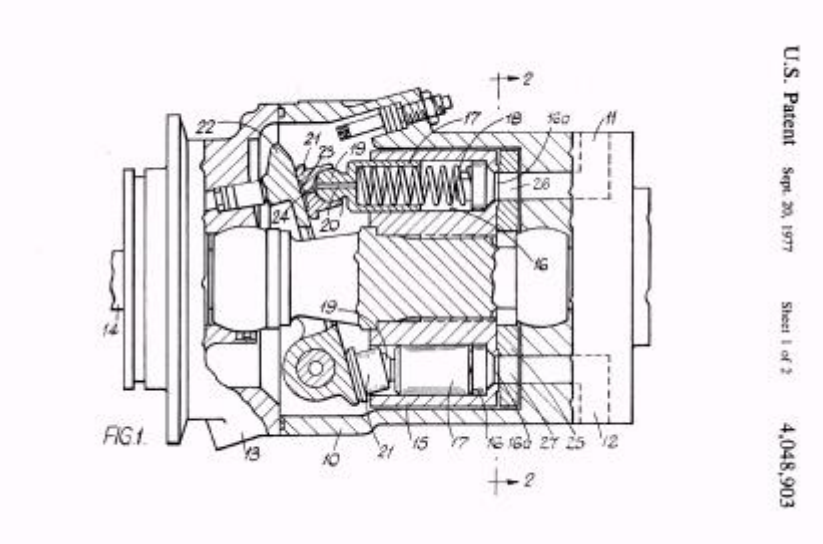


F01B 3/0052

{Cylinder barrel}

Special rules of classification

Illustrative example of subject matter classified in F01B 3/0052

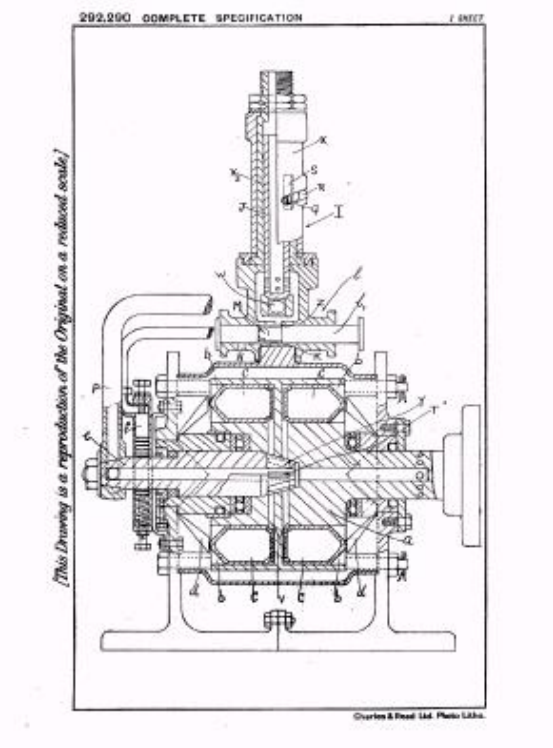


F01B 3/0061

{Conical valve means}

Special rules of classification

Illustrative example of subject matter classified in F01B 3/0061

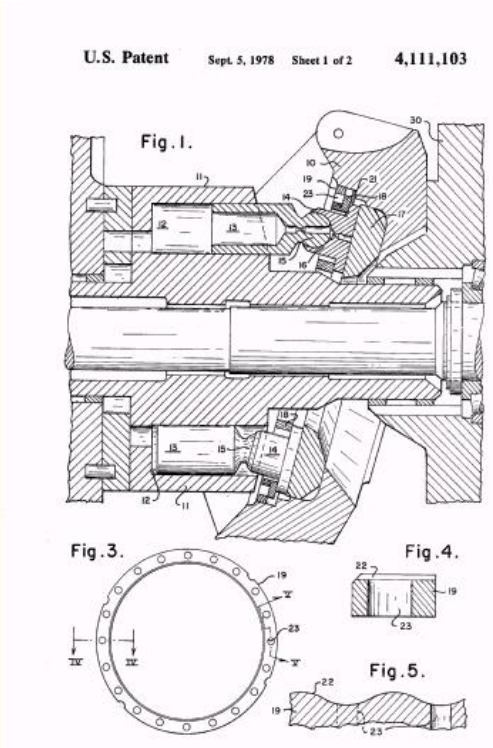


F01B 3/007

{Swash plate}

Special rules of classification

Illustrative example of subject matter classified in F01B 3/007

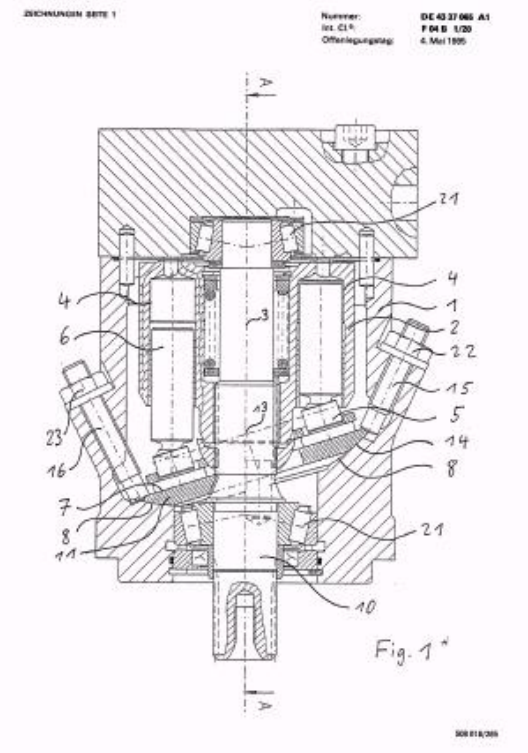


F01B 3/0076

{Connection between cylinder barrel and inclined swash plate}

Special rules of classification

Illustrative example of subject matter classified in F01B 3/0076



F01B 3/0079

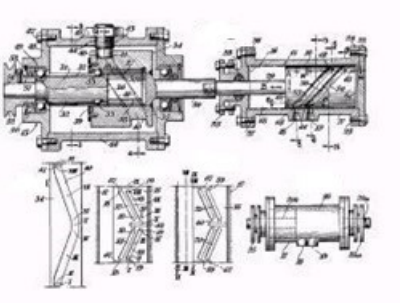
{having pistons with rotary and reciprocating motion, i.e. spinning pistons}

Definition statement

This place covers:

Reciprocating-piston machines or engines with cylinder axes coaxial with, or parallel or inclined to, main shaft axis, wherein the pistons rotate (spin) about their longitudinal axis as they reciprocate.

Illustrative example of subject matter classified in this place:



References

Informative references

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

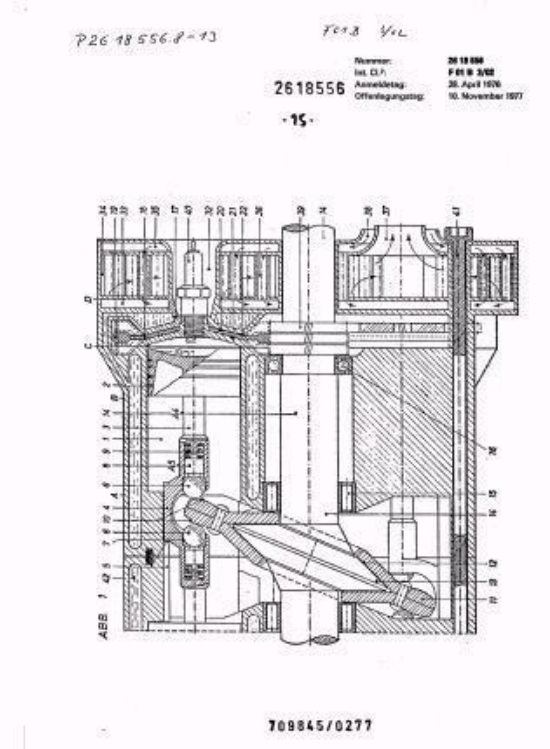
Piston motion being transmitted by curved surfaces	F01B 3/04

F01B 3/02

with wobble-plate

Special rules of classification

Illustrative example of subject matter classified in F01B 3/02



F01B 3/04

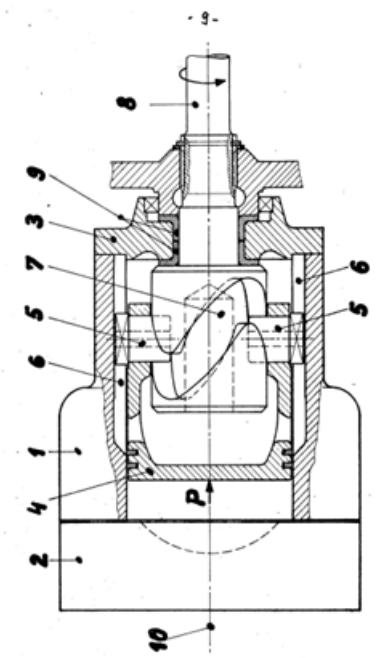
the piston motion being transmitted by curved surfaces

Definition statement

This place covers:

Piston motion being transmitted by curved surfaces, e.g. by cams or grooves.

Illustrative example of subject matter classified in this place:

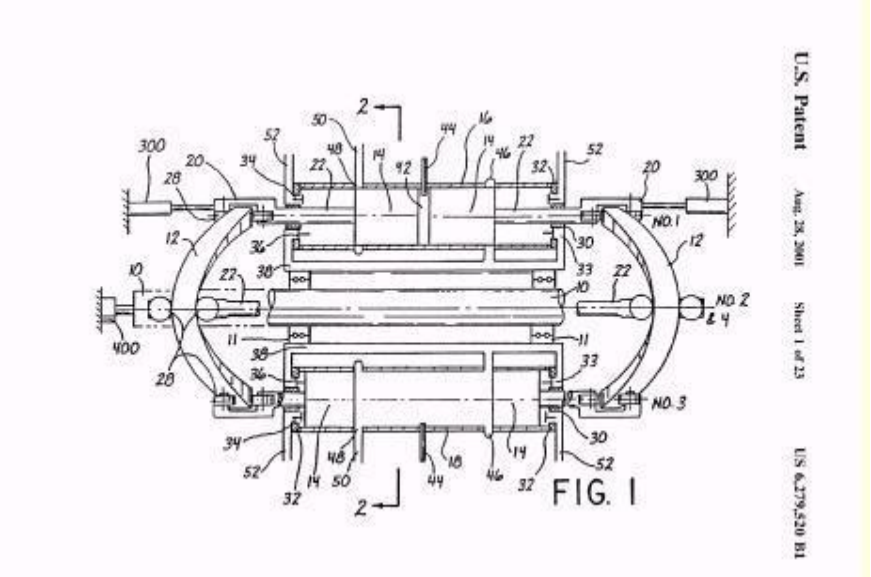


F01B 3/045

{by two or more curved surfaces, e.g. for two or more pistons in one cylinder}

Special rules of classification

Illustrative example of subject matter classified in F01B 3/045

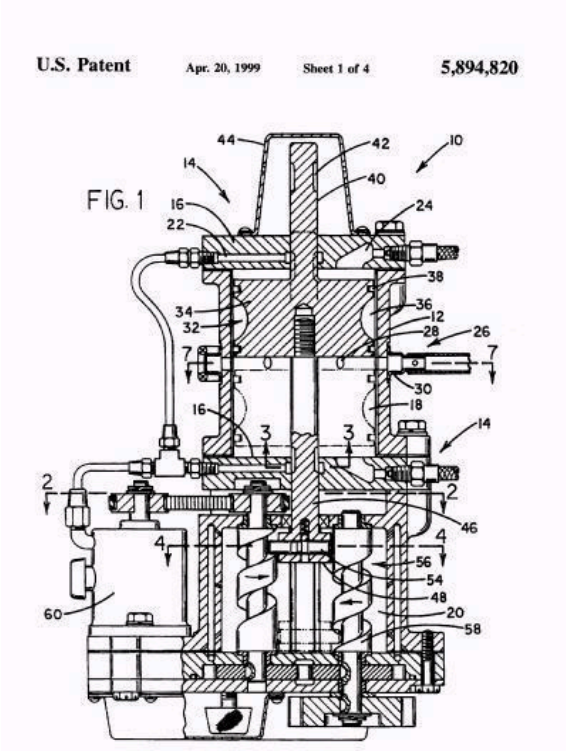


F01B 3/06

by multi-turn helical surfaces and automatic reversal

Special rules of classification

Illustrative example of subject matter classified in F01B 3/06

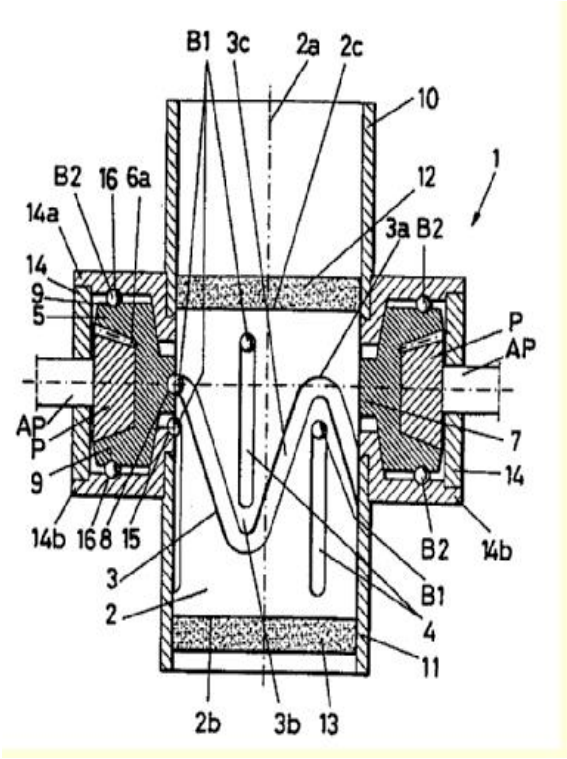


F01B 3/08

the helices being arranged on the pistons

Special rules of classification

Illustrative example of subject matter classified in F01B 3/08



F01B 3/10

Control of working-fluid admission or discharge peculiar thereto

References

Informative references

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

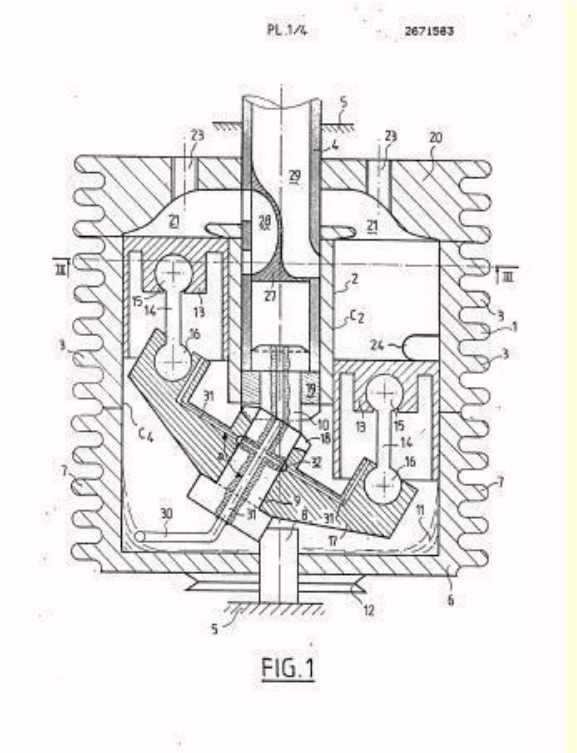
Cyclically operating valves for machines or engines in general	F01L

F01B 3/103

{for machines with rotary cylinder block}

Special rules of classification

Illustrative example of subject matter classified in F01B 3/103

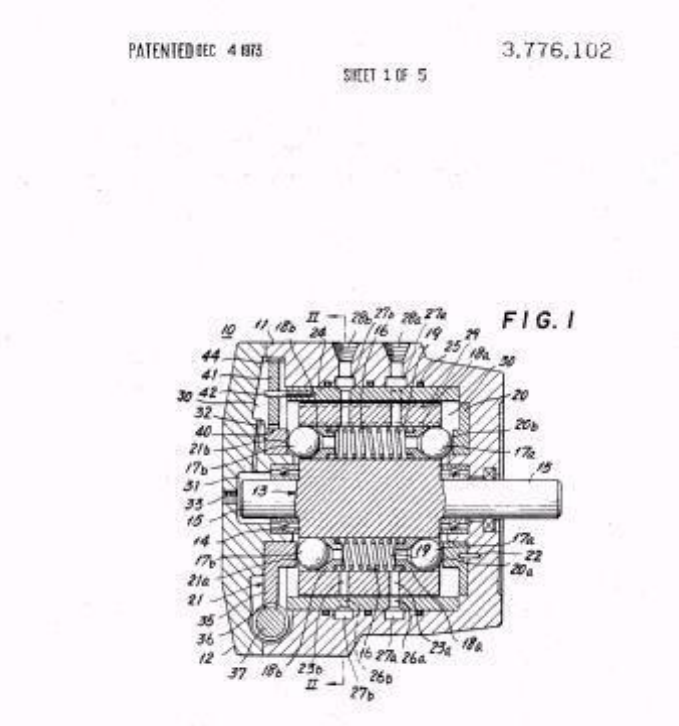


F01B 3/104

{by turning the valve plate}

Special rules of classification

Illustrative example of subject matter classified in F01B 3/104

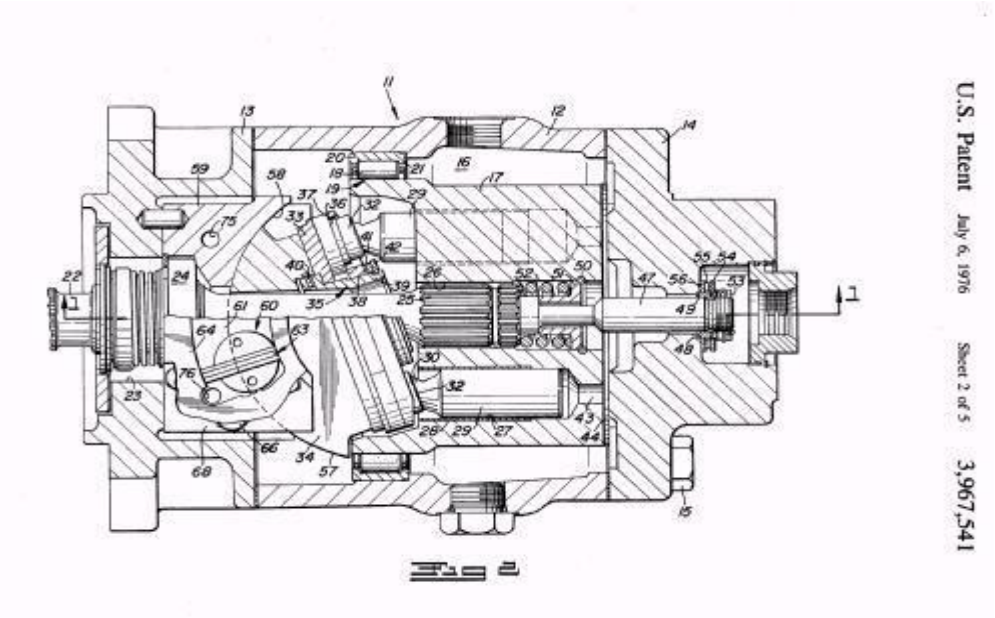


F01B 3/106

{by changing the inclination of the swash plate}

Special rules of classification

Illustrative example of subject matter classified in F01B 3/106

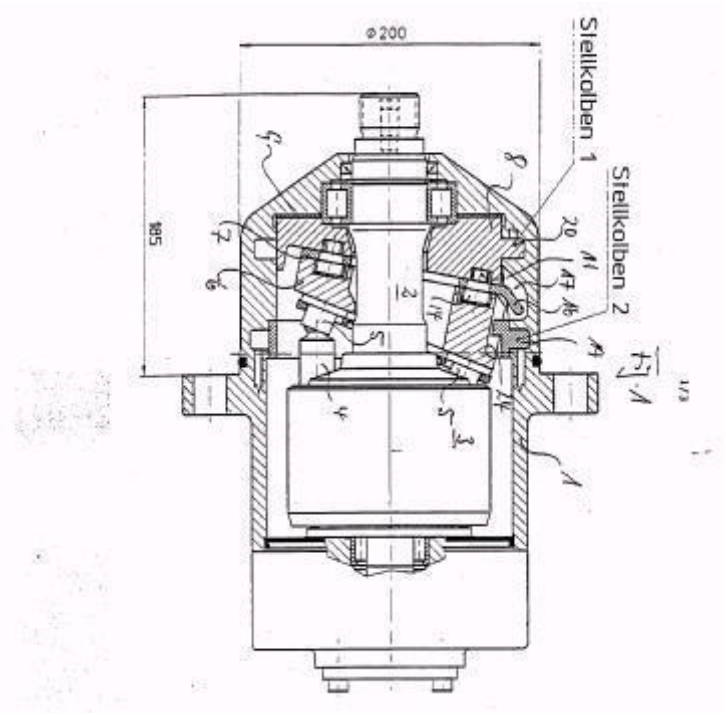


F01B 3/108

{by turning the swash plate (with fixed inclination)}

Special rules of classification

Illustrative example of subject matter classified in F01B 3/108



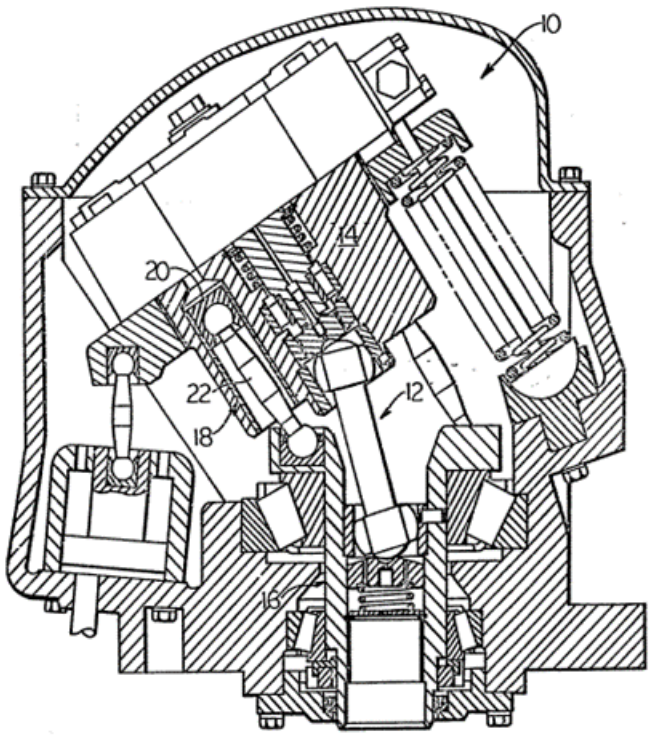
F01B 3/109

{by changing the inclination of the axis of the cylinder barrel relative to the swash plate}

Definition statement

This place covers:

Illustrative example of subject matter classified in this place:



References

Informative references

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

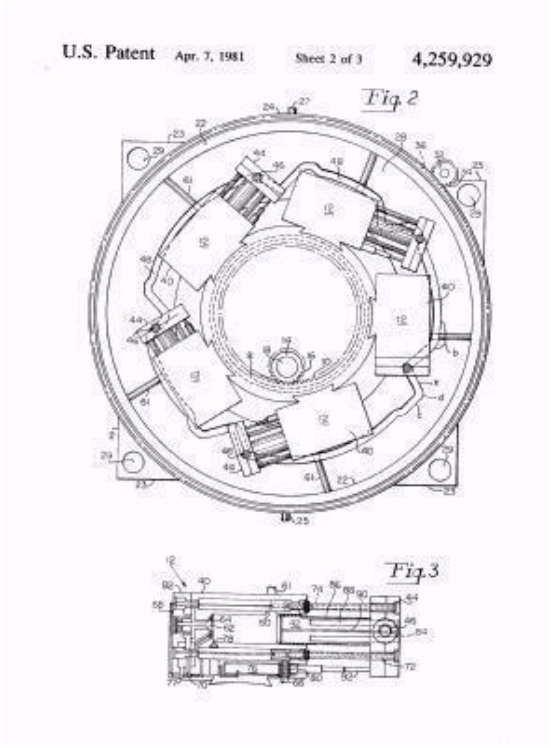
Control of working-fluid admission or discharge by changing inclination of the swash plate	F01B 3/106

F01B 5/00

Reciprocating-piston machines or engines with cylinder axes arranged substantially tangentially to a circle centred on main shaft axis

Special rules of classification

Illustrative example of subject matter classified in F01B 5/00

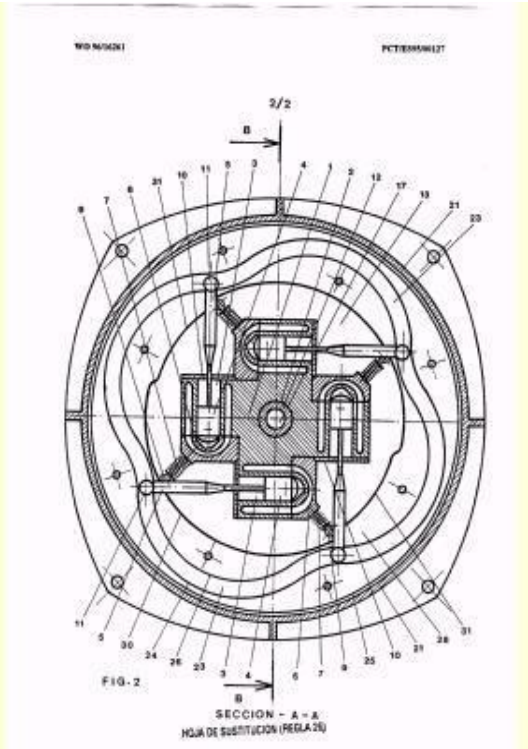


F01B 5/003

{the connection of the pistons with an actuated or actuating element being at the outer ends of the cylinders}

Special rules of classification

Illustrative example of subject matter classified in F01B 5/003

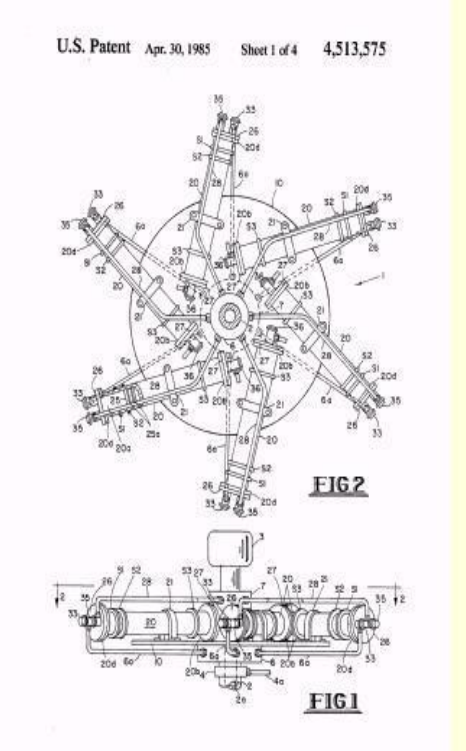


F01B 5/006

{the connection of the pistons with an actuated or actuating element being at the inner ends of the cylinders}

Special rules of classification

Illustrative example of subject matter classified in F01B 5/006



F01B 7/00

Machines or engines with two or more pistons reciprocating within same cylinder or within essentially coaxial cylinders (in opposite arrangement relative to main shaft F01B 1/08)

References

Limiting references

This place does not cover:

Coaxial cylinders in opposite arrangement relative to main shaft	F01B 1/08

Special rules of classification

Illustrative example of subject matter classified in F01B 7/00

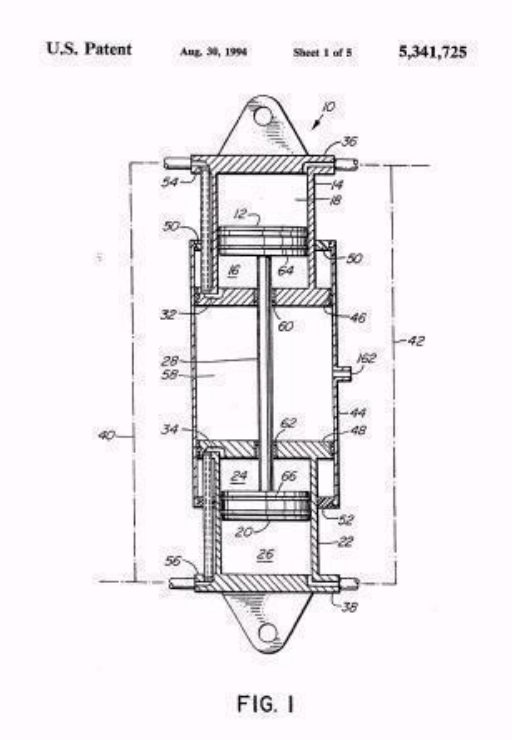


FIG. 1

F01B 7/02

with oppositely reciprocating pistons

Special rules of classification

Illustrative example of subject matter classified in F01B 7/02

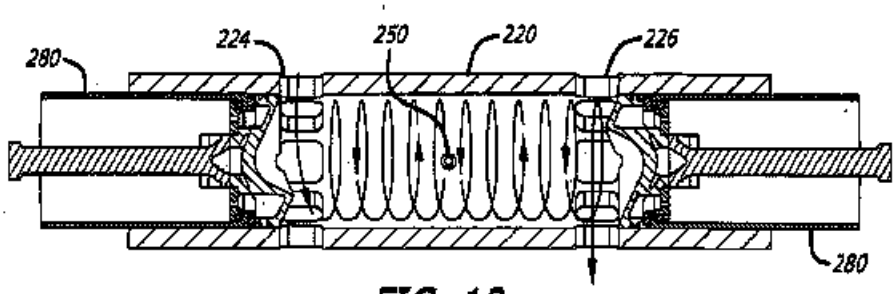


FIG. 12

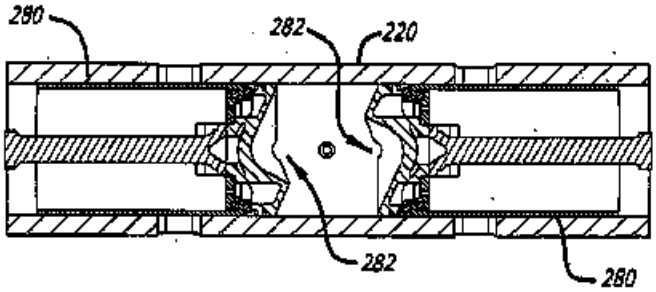


FIG. 13

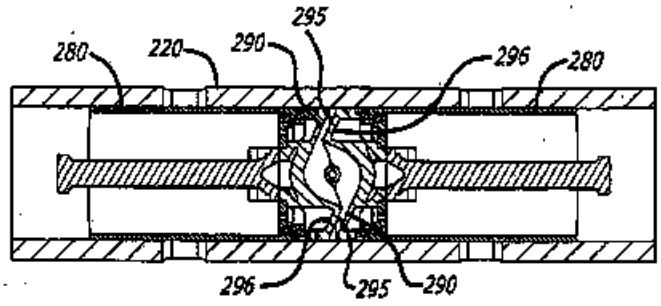


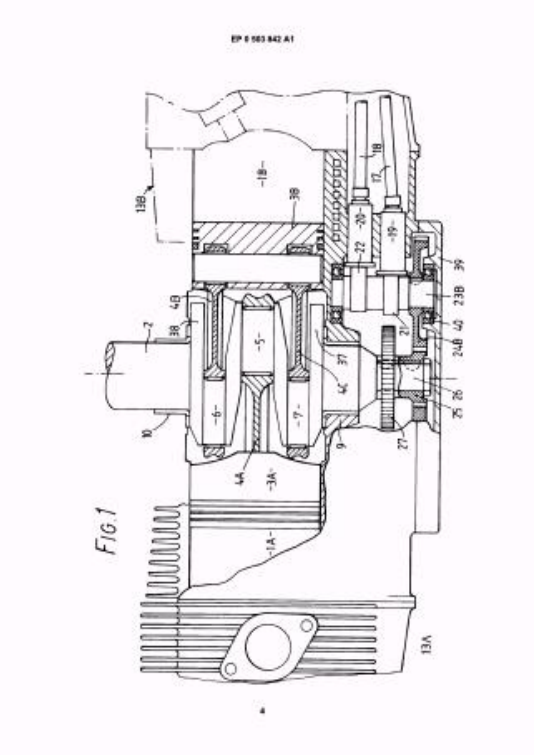
FIG. 14

F01B 7/06

using only connecting-rods for conversion of reciprocatory into rotary motion or vice versa

Special rules of classification

Illustrative example of subject matter classified in F01B 7/06

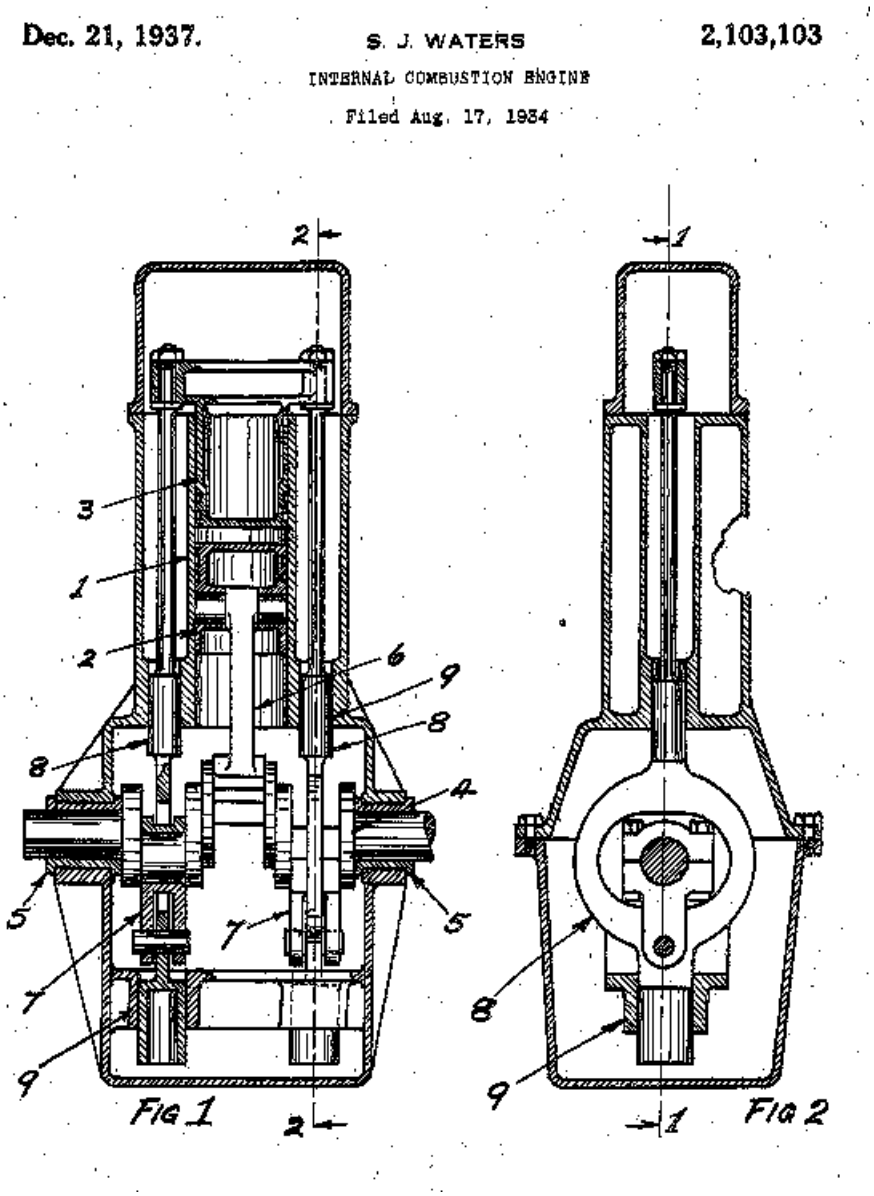


F01B 7/08

with side rods

Special rules of classification

Illustrative example of subject matter classified in F01B 7/08

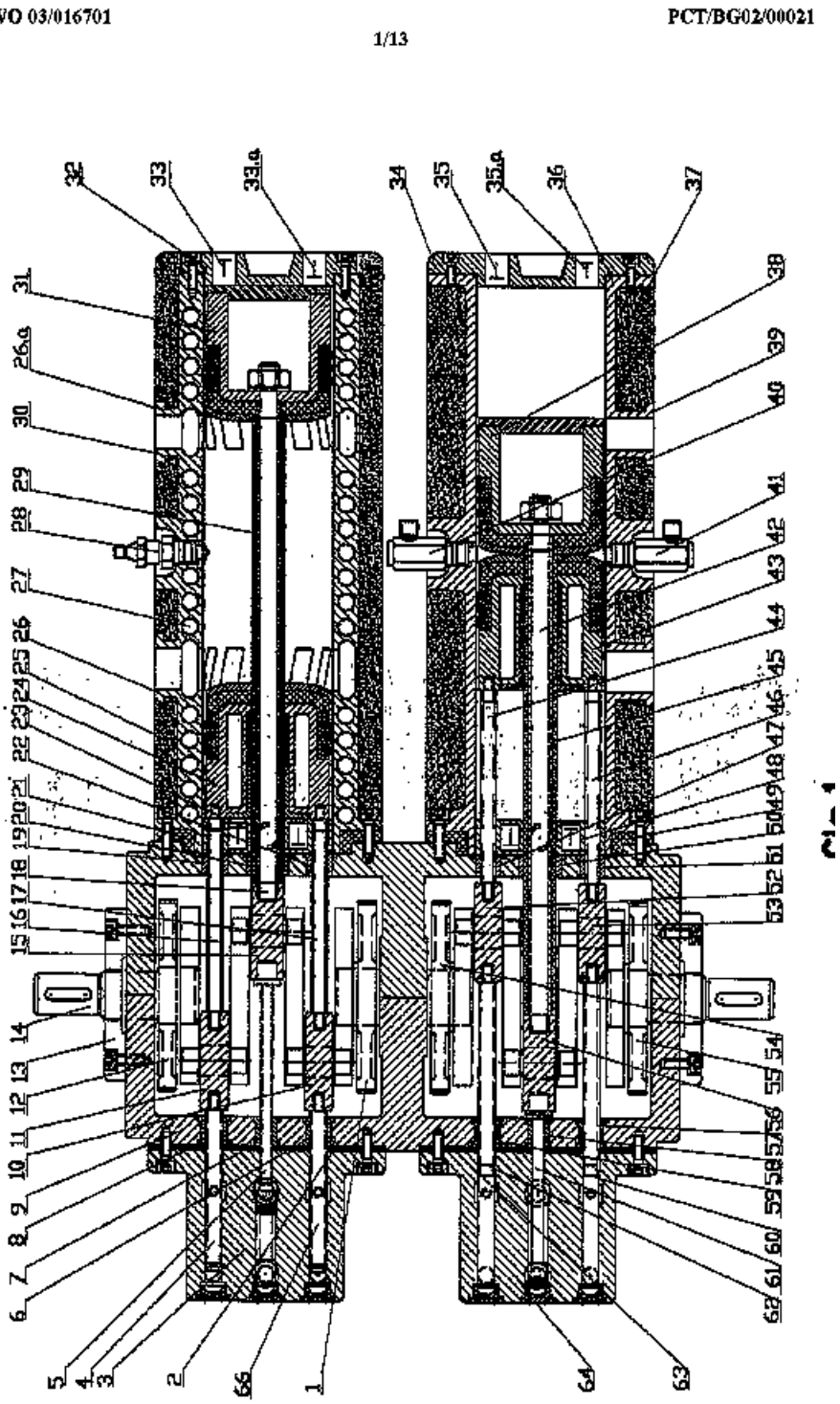


F01B 7/10

having piston-rod of one piston passed through other piston

Special rules of classification

Illustrative example of subject matter classified in F01B 7/10



F01B 7/12

using rockers and connecting-rods

Special rules of classification

Illustrative example of subject matter classified in F01B 7/12

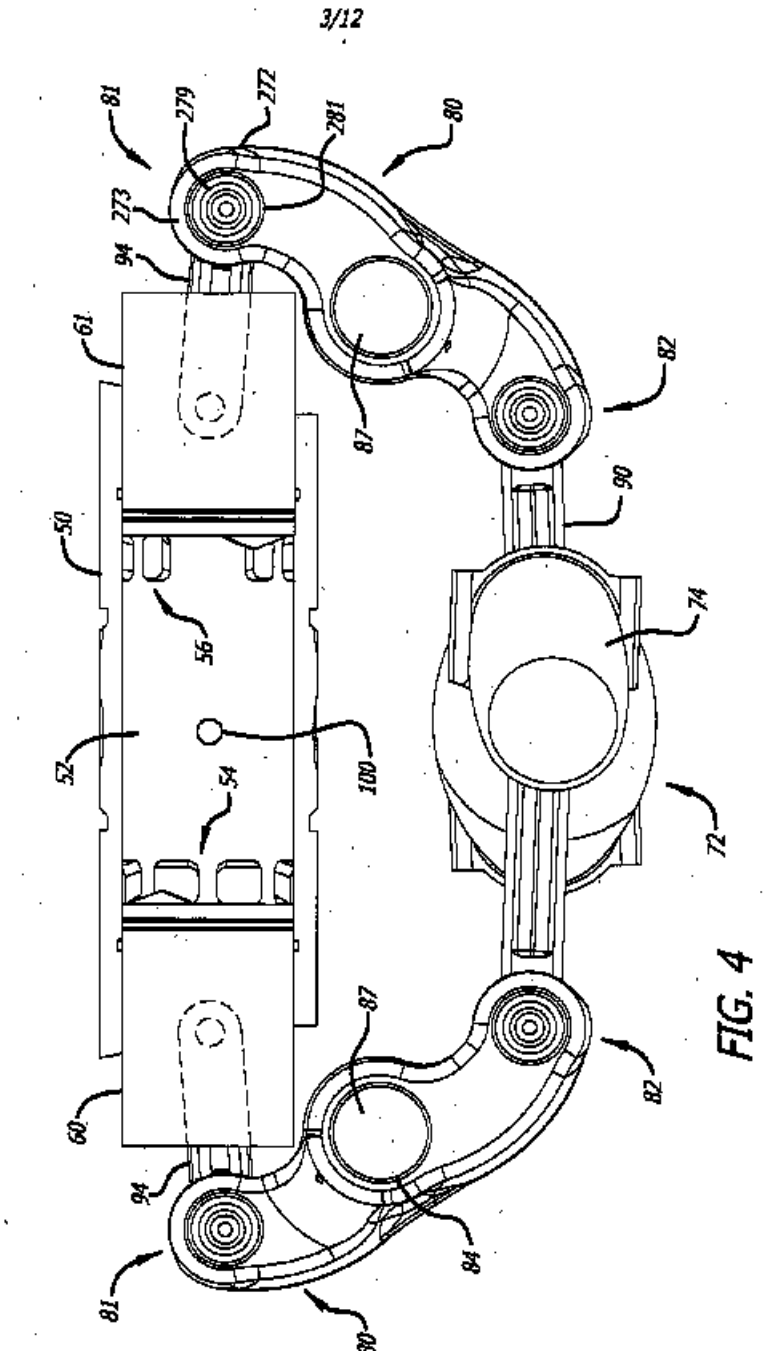


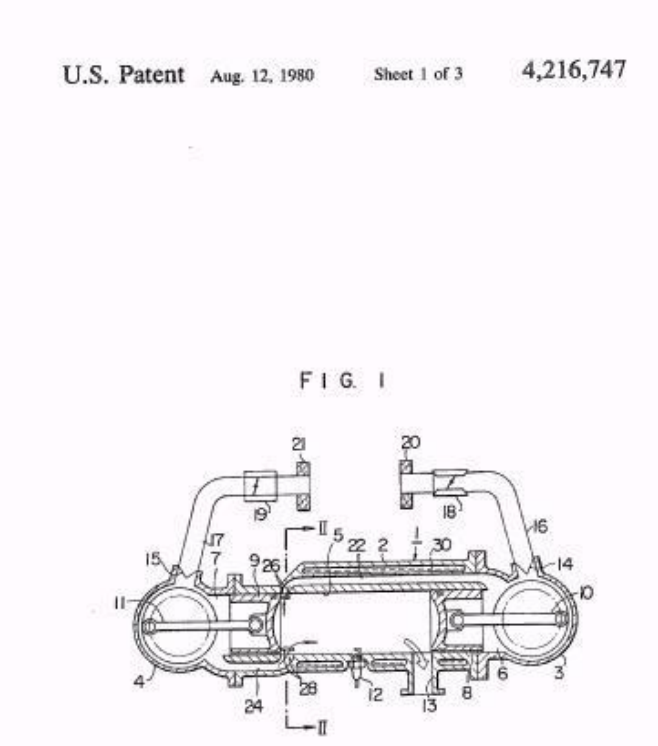
FIG. 4

F01B 7/14

acting on different main shafts

Special rules of classification

Illustrative example of subject matter classified in F01B 7/14

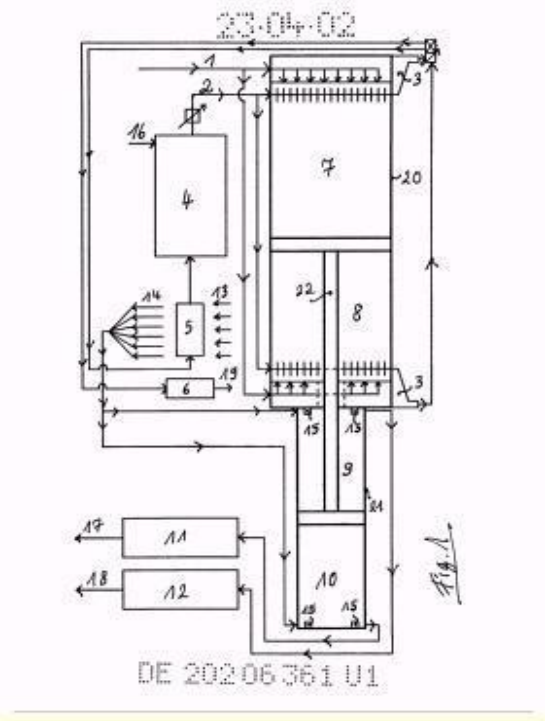


F01B 7/16

with pistons synchronously moving in tandem arrangement

Special rules of classification

Illustrative example of subject matter classified in F01B 7/16



F01B 7/18

with differential piston (F01B 7/20 takes precedence)

References

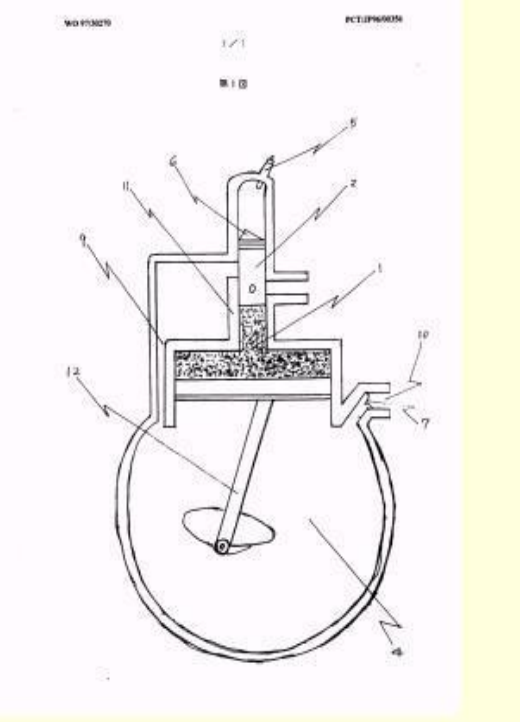
Limiting references

This place does not cover:

With two or more pistons reciprocating one within another	F01B 7/20

Special rules of classification

Illustrative example of subject matter classified in F01B 7/18

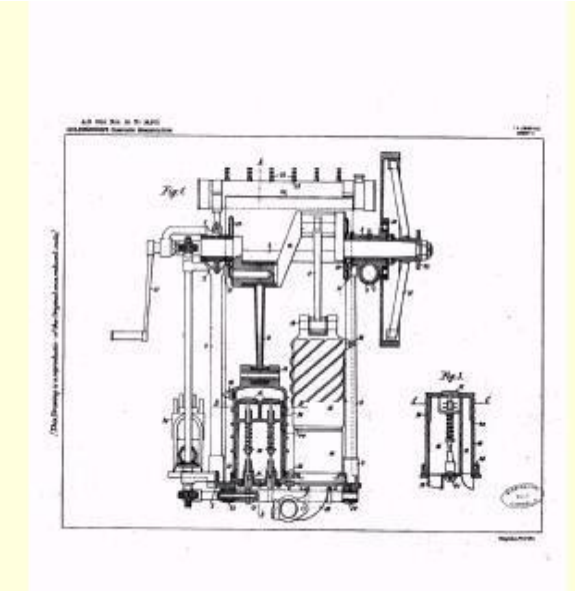


F01B 7/20

with two or more pistons reciprocating one within another, e.g. one piston forming cylinder of the other

Special rules of classification

Illustrative example of subject matter classified in F01B 7/20



F01B 9/00

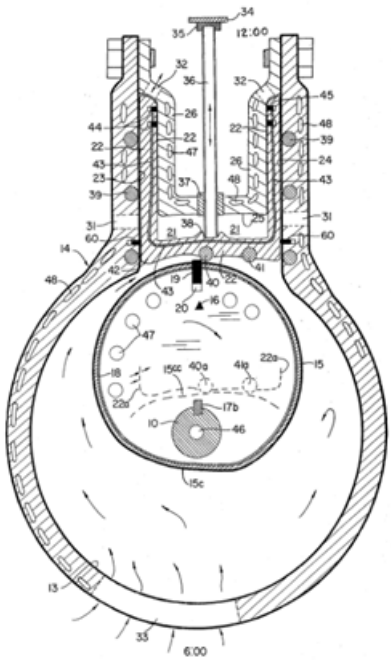
Reciprocating-piston machines or engines characterised by connections between pistons and main shafts, not specific to groups F01B 1/00 - F01B 7/00

Definition statement

This place covers:

Reciprocating-piston machines or engines characterised by connections between pistons and main shafts and not specific to groups F01B 1/00 - F01B 7/00, e.g. when no recognisable crank shaft is present or the main shaft is a cam shaft.

Illustrative example of subject matter classified in this place:



References

Informative references

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

Connections disengageable during idling	F01B 31/24

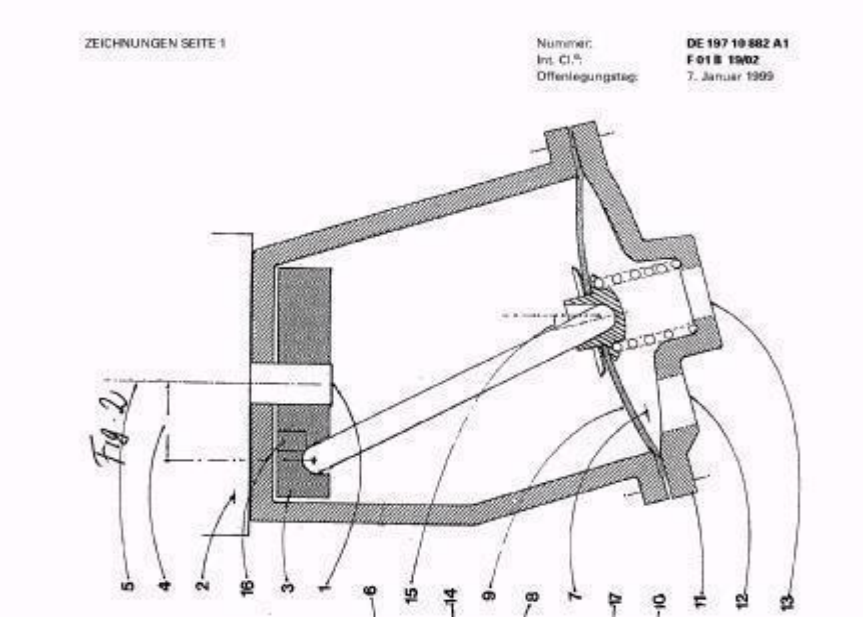
F01B 9/02

with crankshaft

Special rules of classification

Illustrative example of subject matter classified in F01B 9/02

e.g. non-conventional crankshafts:

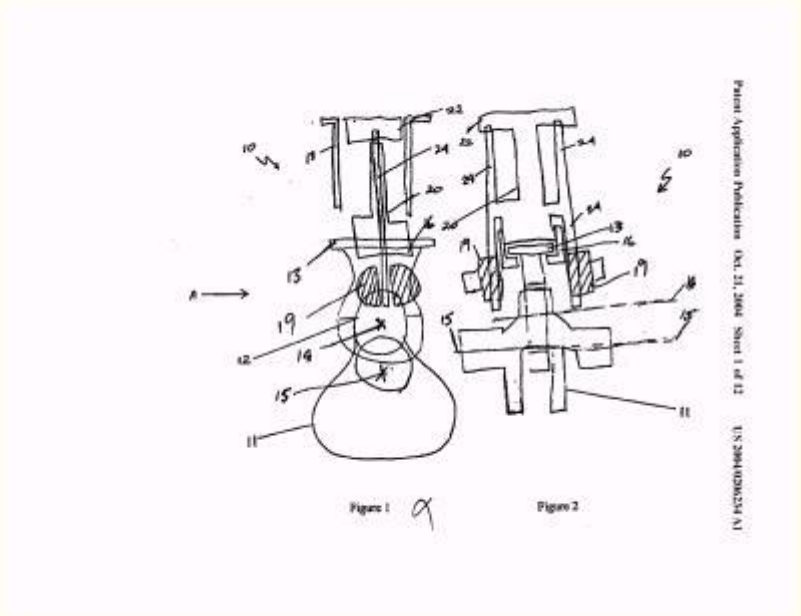


F01B 9/023

{of Bourke-type or Scotch yoke}

Special rules of classification

Illustrative example of subject matter classified in F01B 9/023

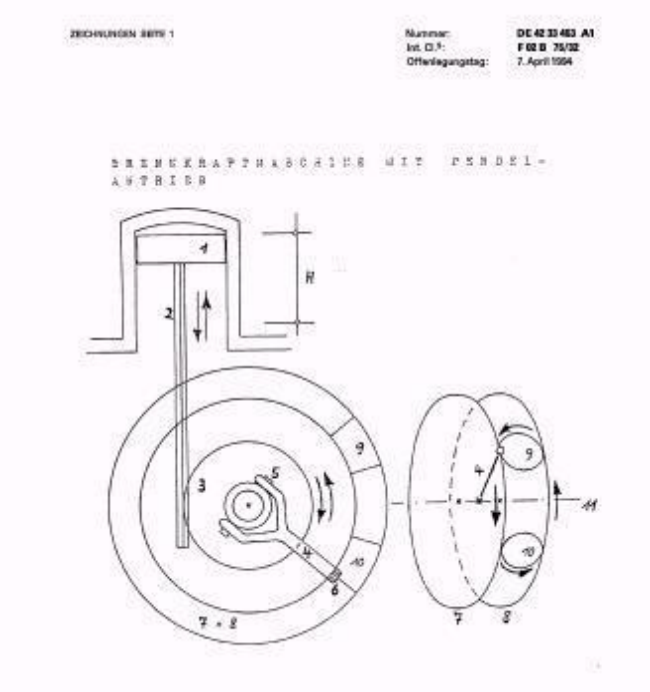


F01B 9/04

with rotary main shaft other than crankshaft

Special rules of classification

Illustrative example of subject matter classified in F01B 9/04

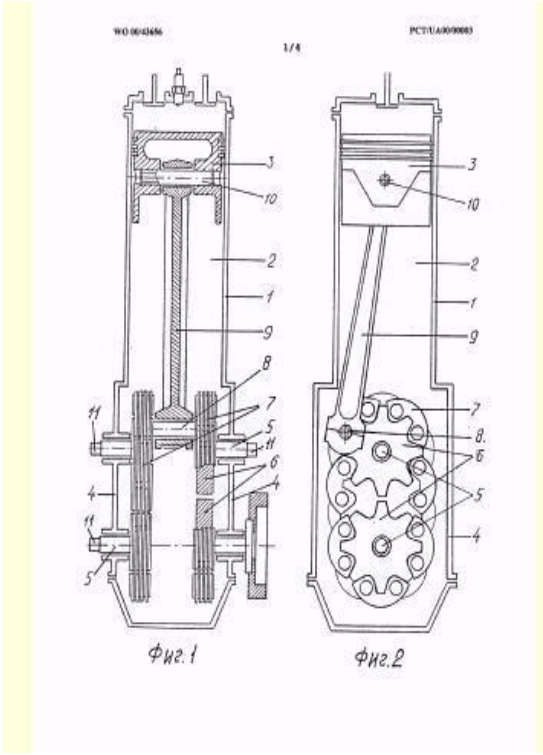


F01B 9/042

{the connections comprising gear transmissions}

Special rules of classification

Illustrative example of subject matter classified in F01B 9/042

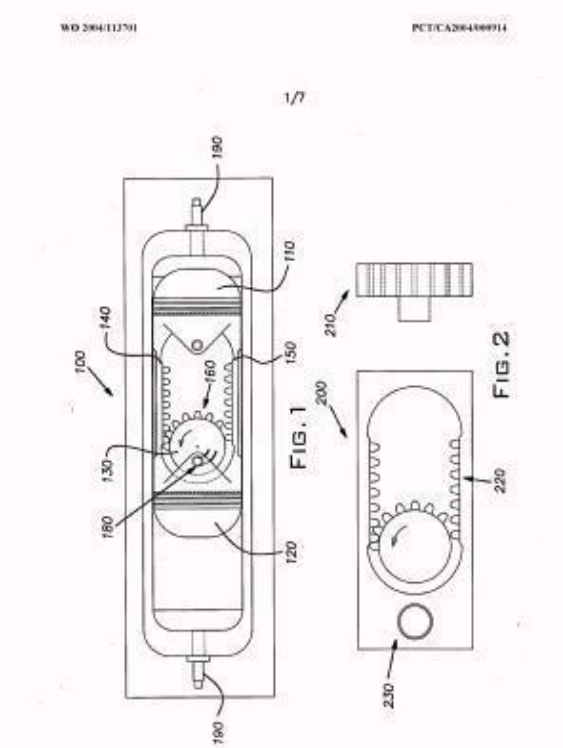


F01B 9/047

{with rack and pinion}

Special rules of classification

Illustrative example of subject matter classified in F01B 9/047

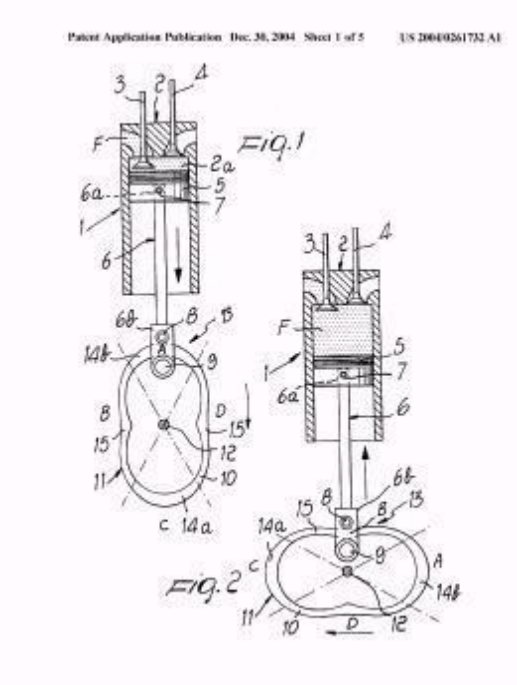


F01B 9/06

the piston motion being transmitted by curved surfaces

Special rules of classification

Illustrative example of subject matter classified in F01B 9/06

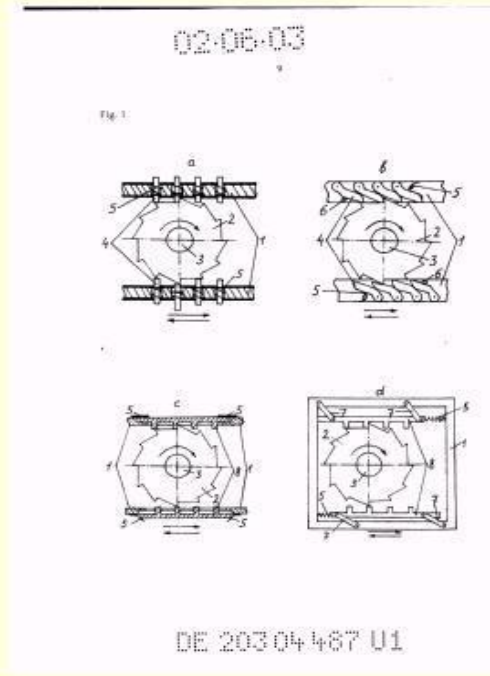


F01B 9/08

with ratchet and pawl

Special rules of classification

Illustrative example of subject matter classified in F01B 9/08

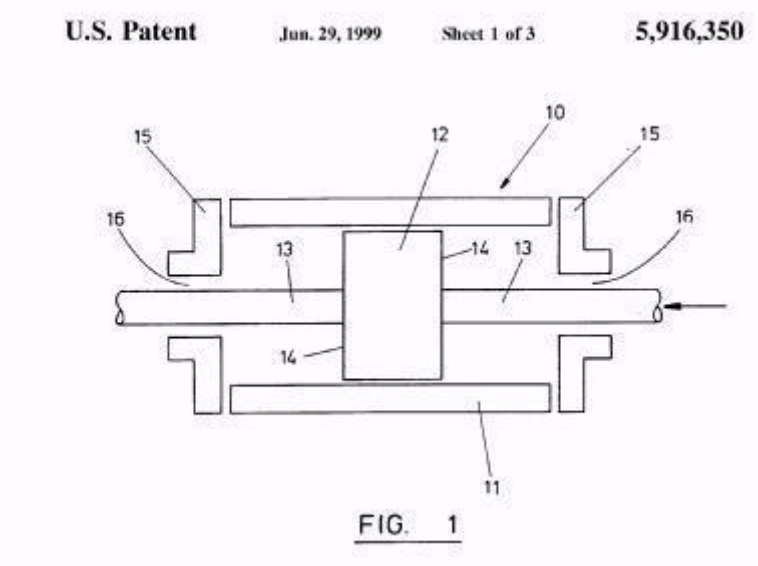


F01B 11/001

{in which the movement in the two directions is obtained by one double acting piston motor}

Special rules of classification

Illustrative example of subject matter classified in F01B 11/001

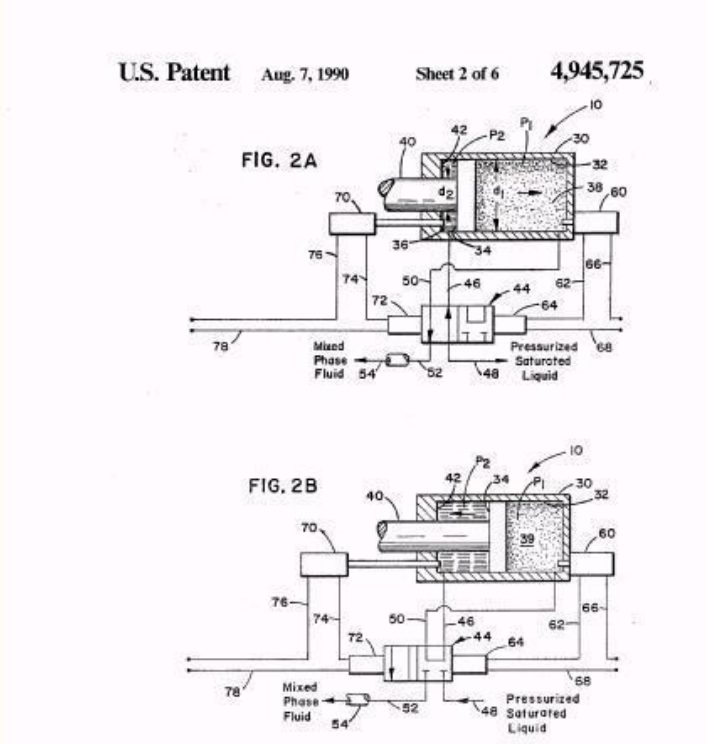


F01B 11/002

{one side of the double acting piston motor being always under the influence of the fluid under pressure}

Special rules of classification

Illustrative example of subject matter classified in F01B 11/002

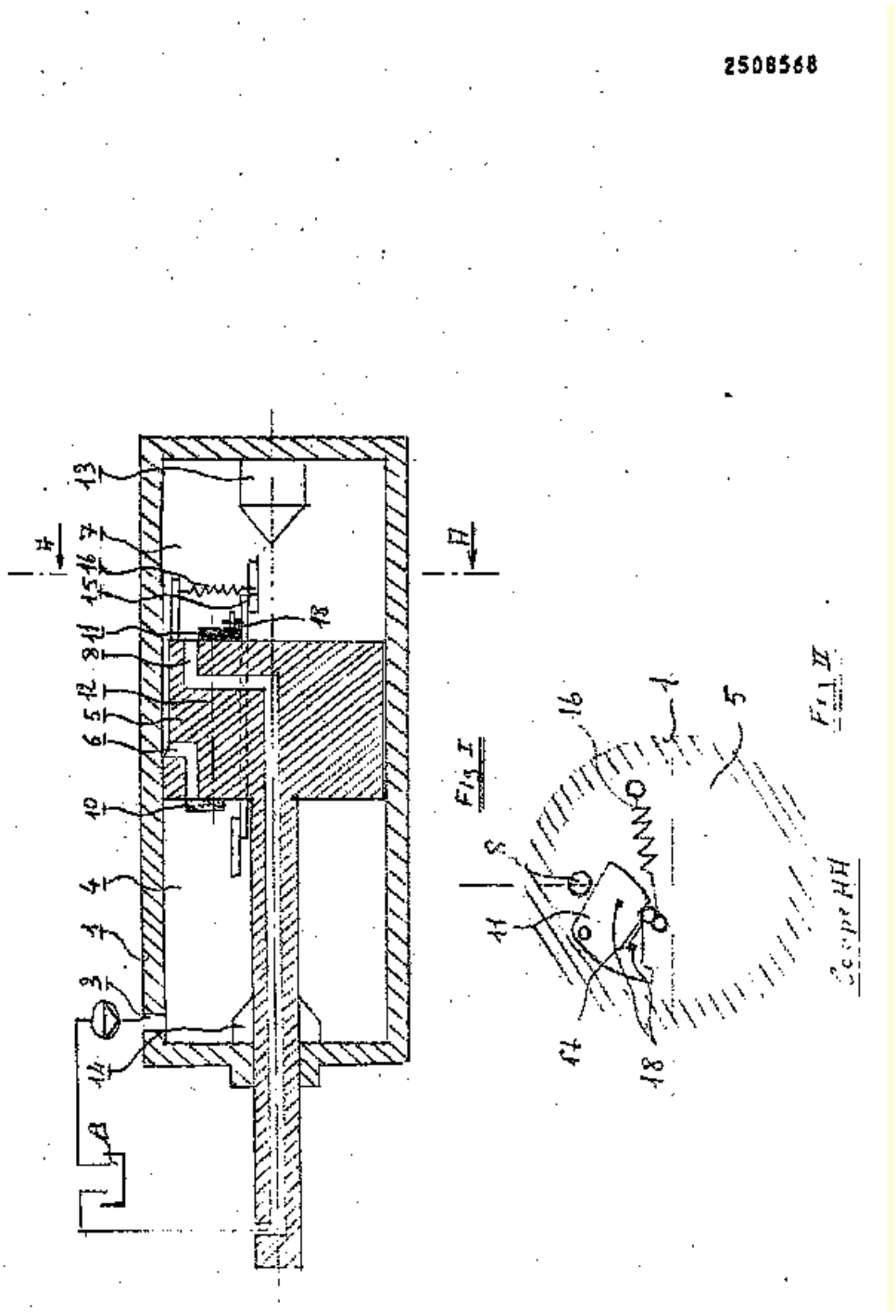


F01B 11/003

{the fluid under pressure being continuously delivered to one motor chamber and reacting the other chamber through a valve located in the piston, to bring the piston back in its start-position}

Special rules of classification

Illustrative example of subject matter classified in F01B 11/003



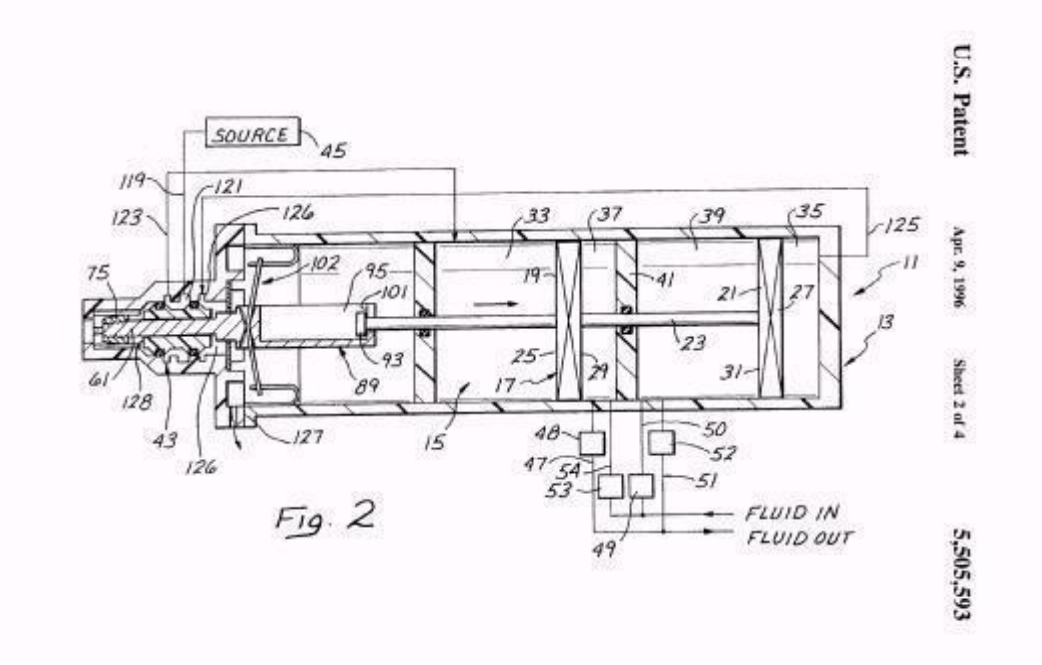
FR2508568 A1

F01B 11/004

{in which the movement in the two directions is obtained by two single acting piston motors, each acting in one direction}

Special rules of classification

Illustrative example of subject matter classified in F01B 11/004

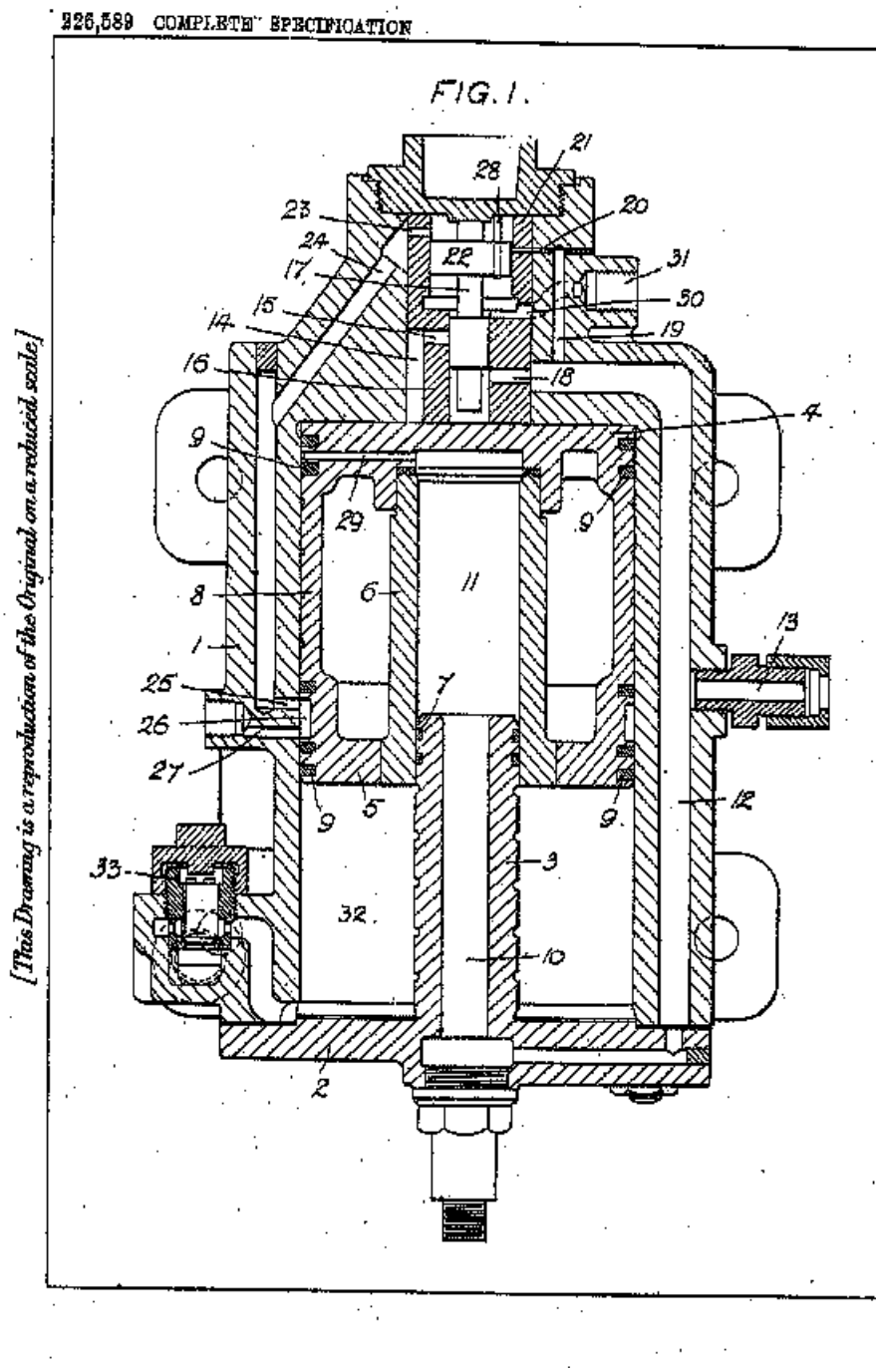


F01B 11/006

{one single acting piston motor being always under the influence of the fluid under pressure}

Special rules of classification

Illustrative example of subject matter classified in F01B 11/006



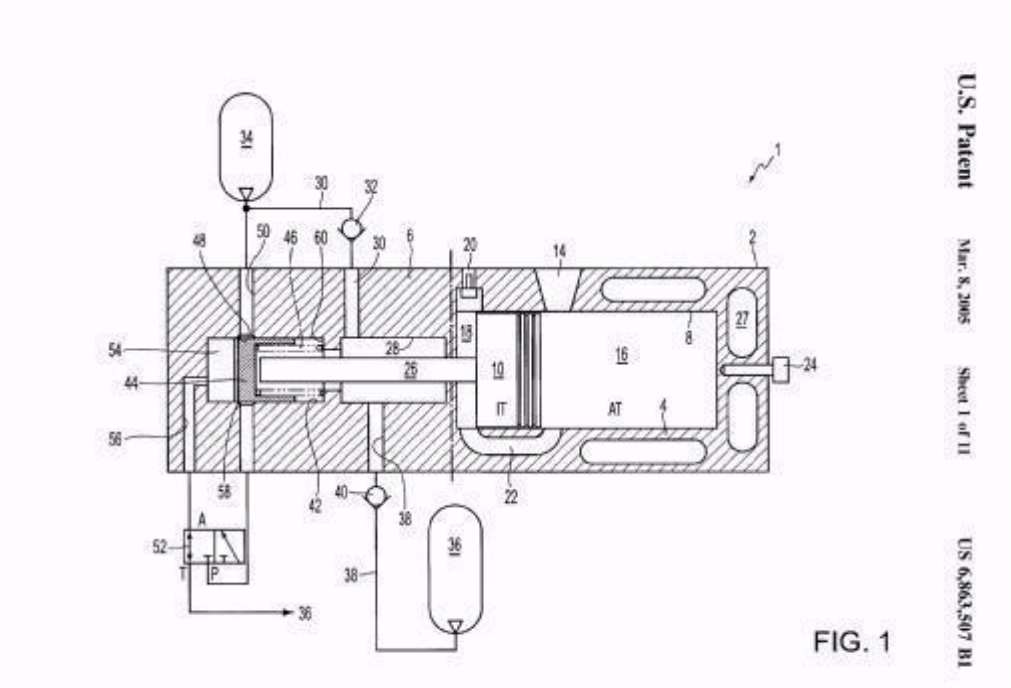
"...the steam supplied through the inlet 13 and the passage 12 enters the port 18, and acting upon the 1 upper face of the element 4 of the double piston (4,5), causes the latter to move downwards against the opposing action of the steam continuously supplied to the space 11...

F01B 11/007

{in which the movement in only one direction is obtained by a single acting piston motor, e.g. with actuation in the other direction by spring means}

Special rules of classification

Illustrative example of subject matter classified in F01B 11/007

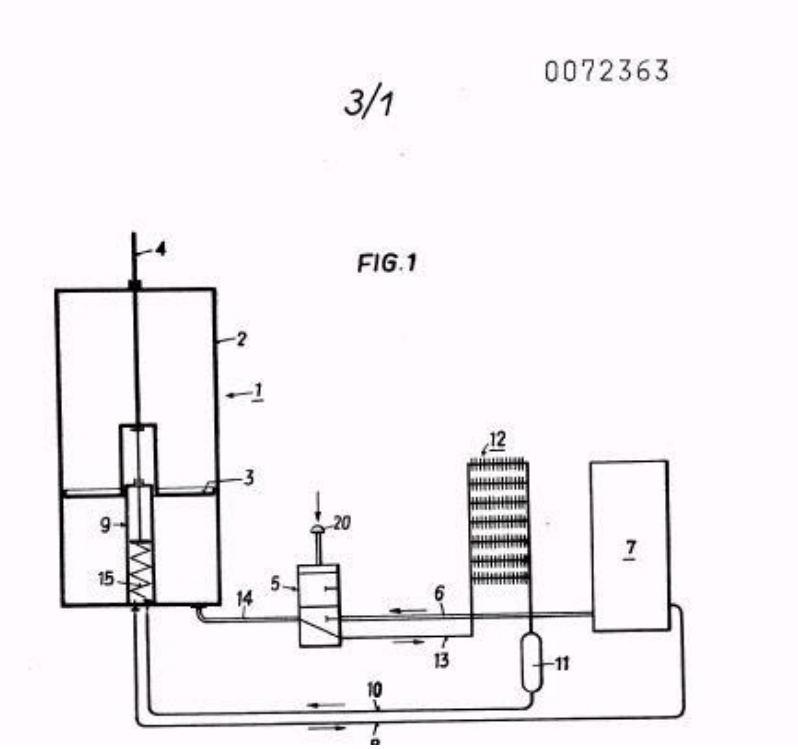


F01B 11/008

{with actuation in the other direction by gravity}

Special rules of classification

Illustrative example of subject matter classified in F01B 11/008

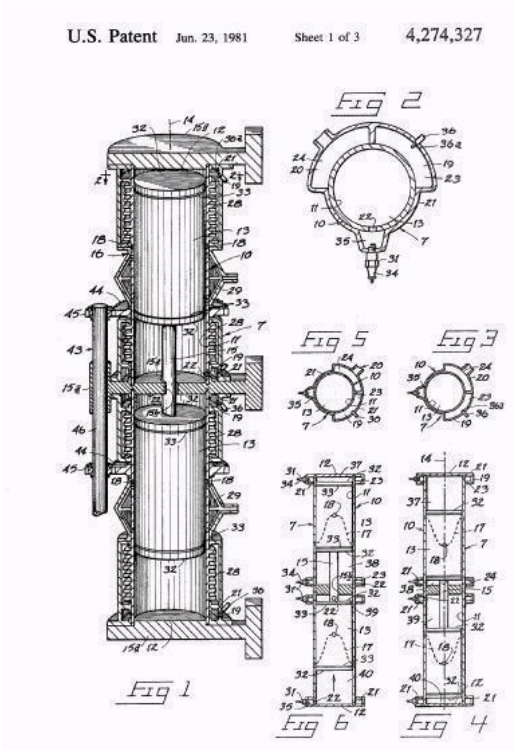


F01B 11/009

{in which the movement in two directions is obtained by two or more double acting piston motors}

Special rules of classification

Illustrative example of subject matter classified in F01B 11/009

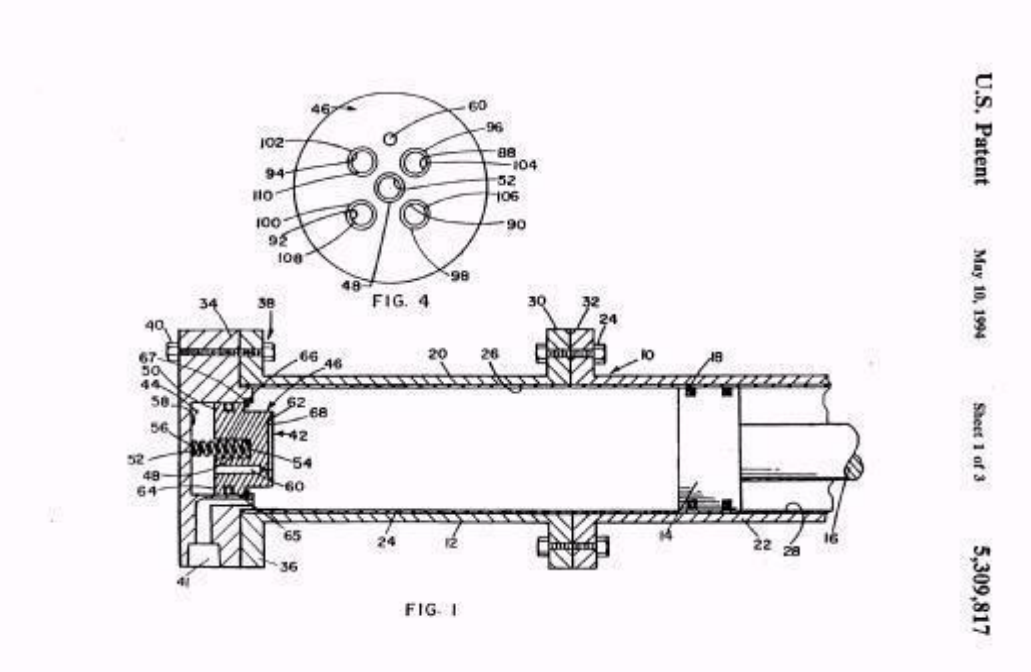


F01B 11/02

Equalising or cushioning devices

Special rules of classification

Illustrative example of subject matter classified in F01B 11/02



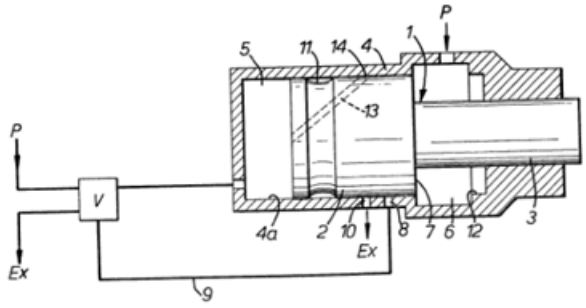
F01B 11/04

Engines combined with reciprocatory driven devices, e.g. hammers

Definition statement

This place covers:

Illustrative example of subject matter classified in this place:



References

Informative references

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

Engines combined with pumps	F01B 23/08

F01B 11/06

for generating vibration only

Special rules of classification

Illustrative example of subject matter classified in F01B 11/06

FIG. 2

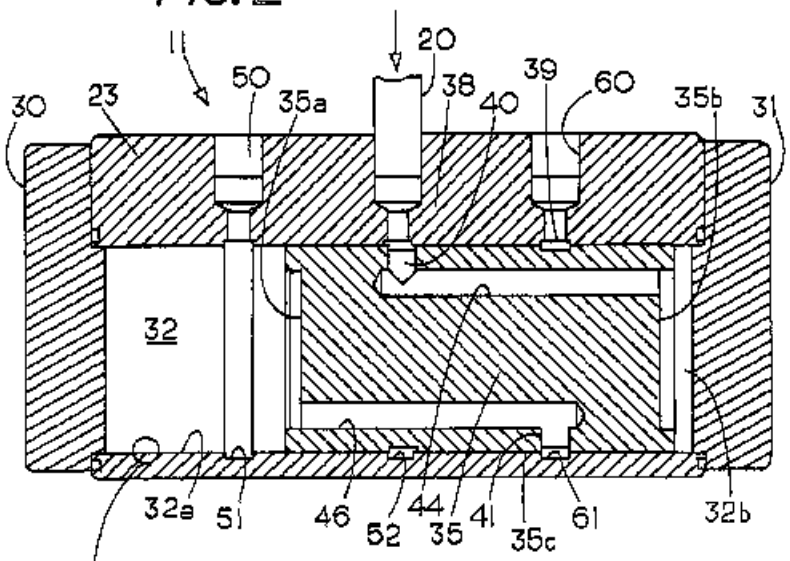


FIG. 2A

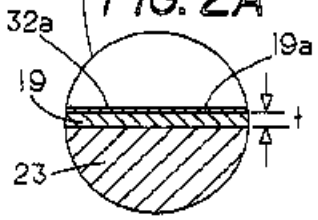
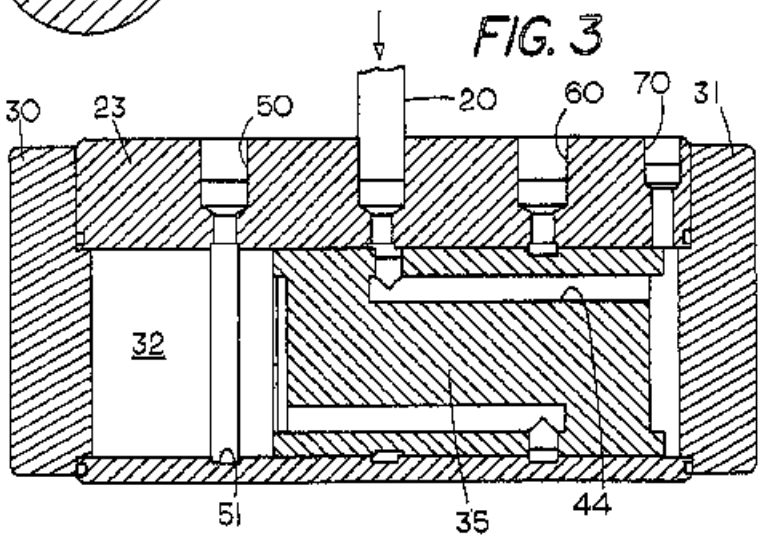


FIG. 3



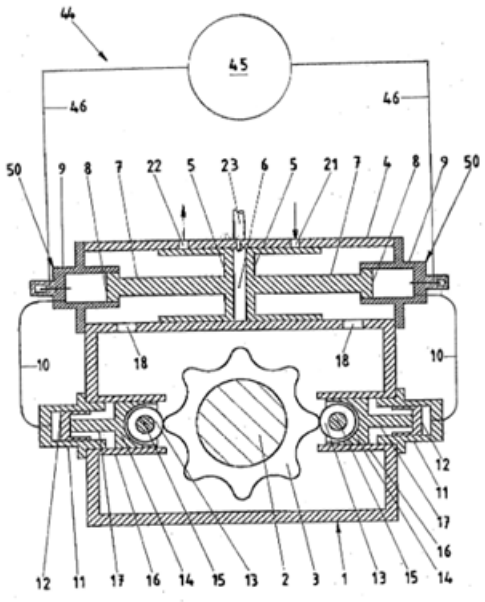
F01B 11/08

with direct fluid transmission link

Definition statement

This place covers:

Illustrative example of subject matter classified in this place:



References

Informative references

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

Equalising or cushioning devices	F01B 11/02

F01B 13/00

Reciprocating-piston machines or engines with rotating cylinders in order to obtain the reciprocating-piston motion

References

Informative references

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

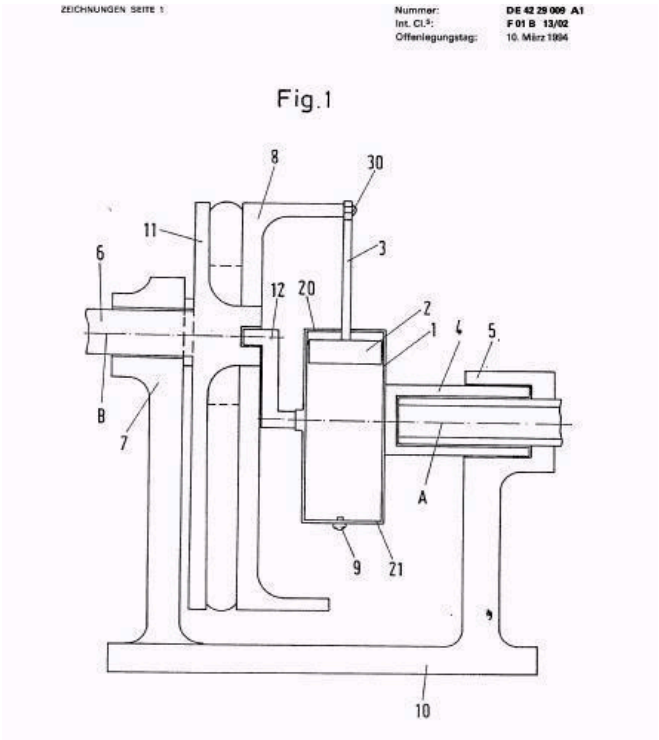
Machines or engines of flexible-wall type	F01B 19/00

F01B 13/02

with one cylinder only

Special rules of classification

Illustrative example of subject matter classified in F01B 13/02



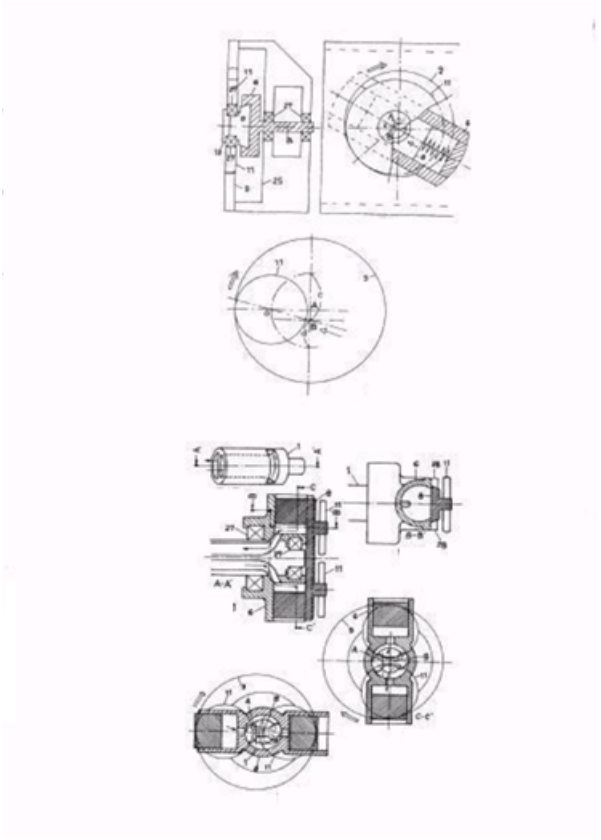
F01B 13/04

with more than one cylinder

Definition statement

This place covers:

Illustrative example of subject matter classified in this place:



References

Informative references

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

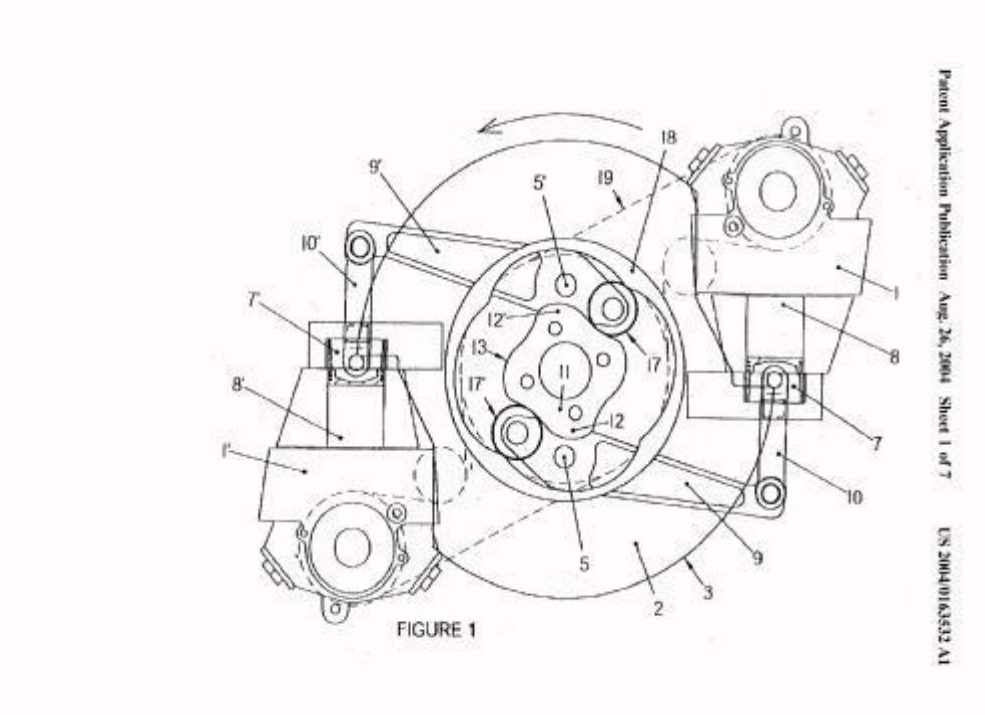
Reciprocating-piston machines or engines with cylinder axes coaxial with, or parallel or inclined to, main shaft axis having rotary cylinder block	F01B 3/0032

F01B 13/045

{with cylinder axes arranged substantially tangentially to a circle centred on main shaft axis}

Special rules of classification

Illustrative example of subject matter classified in F01B 13/045

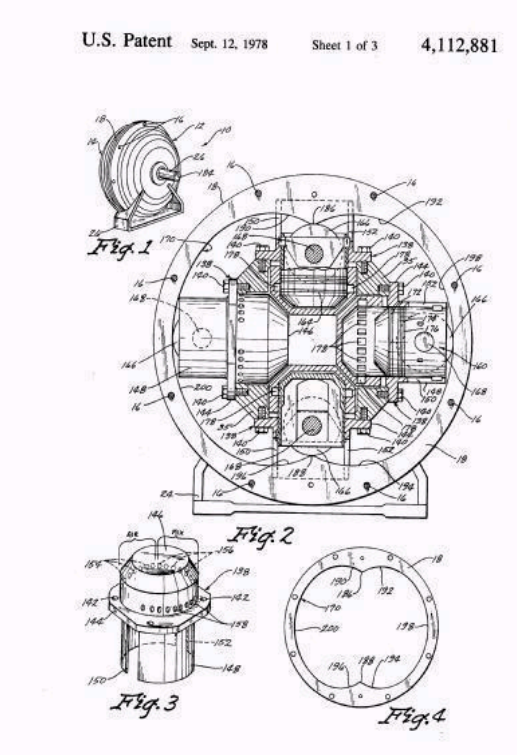


F01B 13/061

{the connection of the pistons with the actuated or actuating element being at the outer ends of the cylinders}

Special rules of classification

Illustrative example of subject matter classified in F01B 13/061

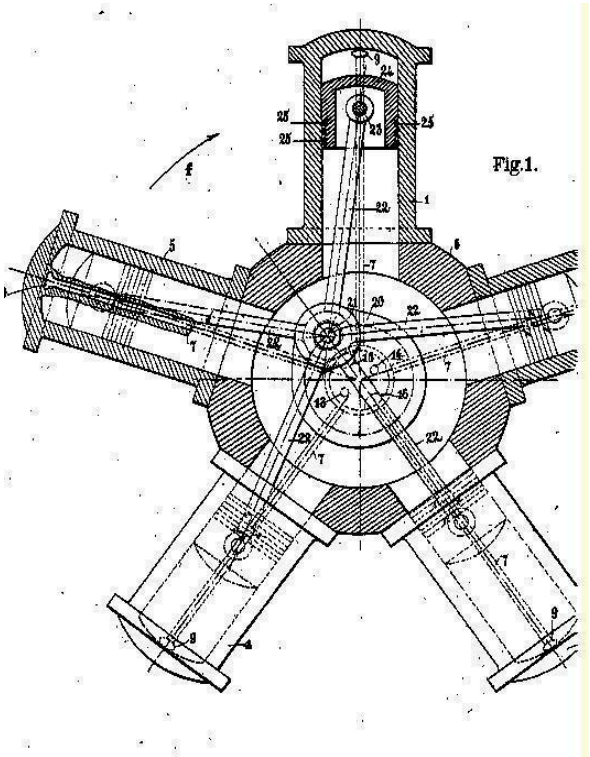


F01B 13/068

{the connection of the pistons with an actuated or actuating element being at the inner ends of the cylinders}

Special rules of classification

Illustrative example of subject matter classified in F01B 13/068



F01B 15/00

Reciprocating-piston machines or engines with movable cylinders other than provided for in group F01B 13/00

Definition statement

This place covers:

Reciprocating-piston machines or engines with movable cylinders other than provided for in group F01B 13/00, e.g. reciprocating-piston machines or engines having reciprocating cylinders or pivoting and oscillating cylinders.

References

Informative references

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

Slide-valve gear or valve arrangements, with cylindrical, sleeve or part-annularly-shaped valves, surrounding working cylinder or piston	F01L 5/06

F01B 17/00

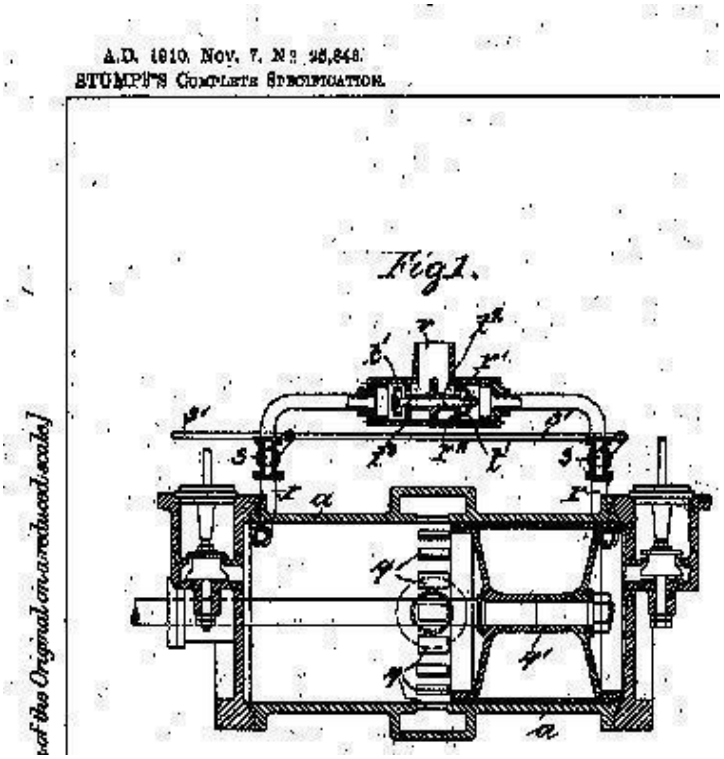
Reciprocating-piston machines or engines characterised by use of uniflow principle

Definition statement

This place covers:

Reciprocating-piston machines or engines characterised by use of uniflow principle:

E.g. compressed gas engines where the working fluid enter a working cylinder, expands and then exits the cylinder.



Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

In patent document the word "uniflow" is often used with the meaning "open circuit where gas enters cylinder, expands, and is then released"

F01B 17/02

Engines

Definition statement

This place covers:

Compressed gas engines.

References

Informative references

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

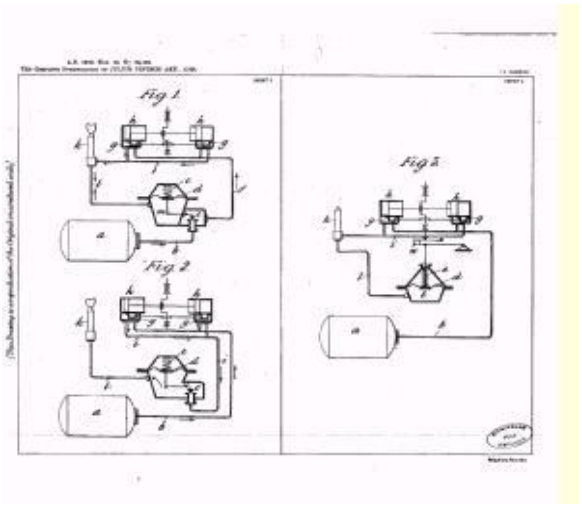
Arrangement or mounting of steam or gaseous-pressure propulsion units of the piston type in vehicles	B60K 3/02
Arrangement or mounting of plural diverse prime-movers for mutual or common propulsion, prime movers comprising combustion engines and a chargeable fluidic accumulator for storing fluid energy	B60K 6/12

F01B 17/022

{with fluid heating}

Special rules of classification

Illustrative example of subject matter classified in F01B 17/022



F01B 17/027

{using separators}

Definition statement

This place covers:

Separators for separating liquid or oil from compressed gas for gas engines.

F01B 17/04

Steam engines

References

Informative references

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

Toys	A63H
Steam engine plants	F01K

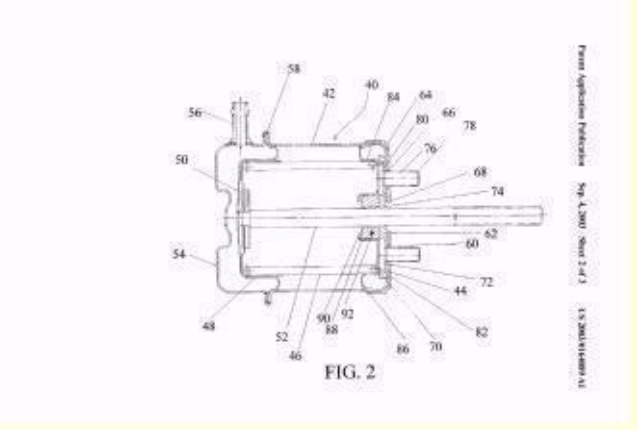
F01B 19/00

Positive-displacement machines or engines of flexible-wall type

Definition statement

This place covers:

Positive-displacement machines or engines of flexible-wall type. E.g. where the piston is made of a diaphragm or bellows.

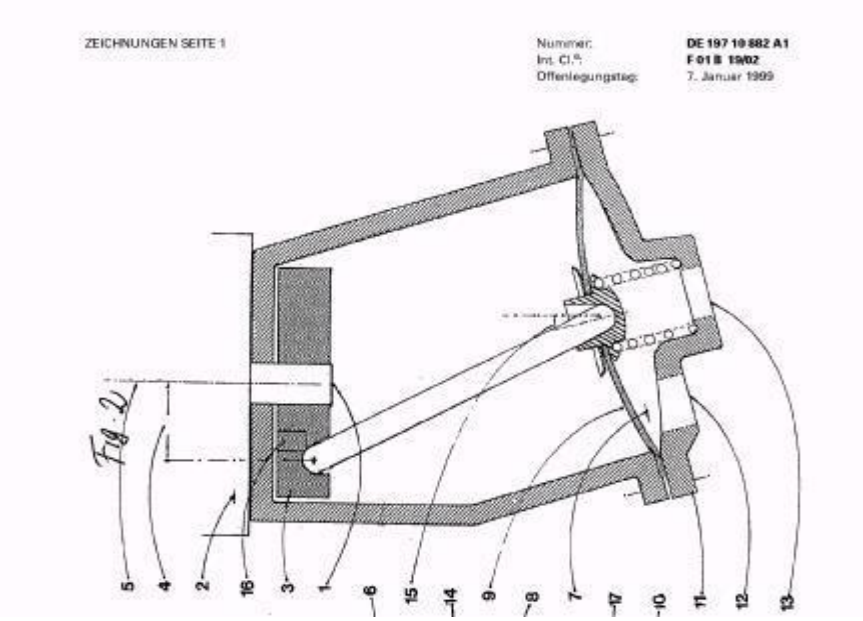


F01B 19/02

with plate-like flexible members

Special rules of classification

Illustrative example of subject matter classified in F01B 19/02

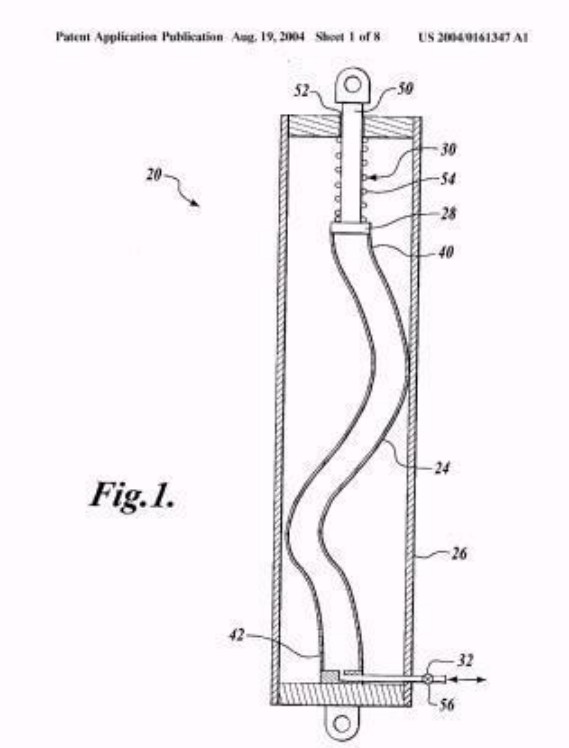


F01B 19/04

with tubular flexible members

Special rules of classification

Illustrative example of subject matter classified in F01B 19/04



F01B 21/00

Combinations of two or more machines or engines (F01B 23/00 takes precedence)

Definition statement

This place covers:

Combinations of two or more machines or engines, e.g. a combined internal combustion engine and steam engine.

References

Limiting references

This place does not cover:

Adaptations of machines or engines for special use; Combinations of engines with devices driven thereby	F01B 23/00

Informative references

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

Combinations of two or more positive-displacement pumps in pumping installations or systems specially adapted for elastic fluids	F04B 41/06

Combinations of two or more machines or pumps, each being of rotary-piston or oscillating-piston type; Pumping installations	F04C 11/00
Combinations of two or more pumps, each being of rotary-piston or oscillating-piston type, specially adapted for elastic fluids; Pumping installations specially adapted for elastic fluids; Multi-stage pumps specially adapted for elastic fluids	F04C 23/00
Combinations of two or more non-positive-displacement pumps in pumping installations or systems	F04D 13/12
Combinations of two or more non-positive-displacement pumps in pumping installations or systems specially adapted for elastic fluids	F04D 25/16
Rotary fluid gearing using pumps and motors of the volumetric type, i.e. passing a predetermined volume of fluid per revolution	F16H 39/00
Rotary fluid gearing of the hydrokinetic type	F16H 41/00
Other fluid gearing, e.g. with oscillating input or output	F16H 43/00
Combinations of fluid gearings for conveying rotary motion with couplings or clutches	F16H 45/00

F01B 23/00

Adaptations of machines or engines for special use; Combinations of engines with devices driven thereby

References

Informative references

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

Reciprocating-piston machines or engines without rotary main shaft, e.g. of free-piston type	F01B 11/00
Rotary fluid gearing using pumps and motors of the volumetric type, i.e. passing a predetermined volume of fluid per revolution	F16H 39/00
Rotary fluid gearing of the hydrokinetic type	F16H 41/00
Other fluid gearing, e.g. with oscillating input or output	F16H 43/00
Combinations of fluid gearings for conveying rotary motion with couplings or clutches	F16H 45/00

F01B 25/00

Regulating, controlling or safety means (controlling combustion engines F02D)

References

Limiting references

This place does not cover:

Controlling combustion engines	F02D

Informative references

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

Regulating or controlling in general	G05

F01B 25/02

Regulating or controlling by varying working-fluid admission or exhaust, e.g. by varying pressure or quantity

References

Informative references

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

Distributing or expansion valve gear	F01L

F01B 25/10

Arrangements or adaptations of working-fluid admission or discharge valves

References

Informative references

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

Valves in general	F16K

F01B 27/00

Starting of machines or engines (starting combustion engines F02N)

References

Limiting references

This place does not cover:

Starting combustion engines	F02N

F01B 27/08

Means for moving crank off dead-centre

References

Informative references

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

Turning-gear in general	F16H

F01B 29/10

Engines

References

Informative references

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

Refrigeration machines	F25B

F01B 31/00

Component parts, details or accessories not provided for in, or of interest apart from, other groups

References

Informative references

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

Machine or engine casings, other than those peculiar to steam engines	F16M

F01B 31/04

Means for equalising torque in reciprocating-piston machines or engines

References

Informative references

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

Suppression of vibrations in systems; Means or arrangements for avoiding or reducing out-of-balance forces, e.g. due to motion	F16F 15/00

F01B 31/08

Cooling of steam engines; Heating; Heat insulation

References

Informative references

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

Cooling of fluid machines or engines in general	F01P
Heat insulation in general	F16L 59/00

F01B 31/10

Lubricating arrangements of steam engines

References

Informative references

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

Lubricating arrangements of fluid machines or engines in general	F01M

F01B 31/12

Arrangements of measuring or indicating devices

References

References out of a residual place

Examples of places in relation to which this place is residual:

Warning devices	F01B 25/26

Informative references

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

Measuring instruments or the like per se	G01

F01B 31/16

Silencers specially adapted for steam engines

References

Informative references

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

Arrangements of exhaust pipes or tubes on steam engines	F01B 31/30
Gas-flow silencers or exhaust silencers for machines or engines in general	F01N

F01B 31/34

Safety means against water hammer or against the penetration of water

References

Informative references

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

Steam traps	F16T