MISCELLANEOUS

1 R

1 A
.Fuels, lubricants and additives

2

COMBINED DEVICES

3

Generating plants

200

RO unmatched

201 .Reversible

202 .With means to control degree of compression

203 .With combusted gas treatment or handling means

204 .With compression volume means in uninterrupted communication with expansion volume means

205 .With fuel injection means

206 ..And pump or control means

207 ..Into intake port

208 ..Into intake chamber

209 ..Into prechamber

210 .With ignition means

211 ..Plural

212 .With plural compression volume means

213 ..In series

214 .With plural expansion volume means

215 ..In series

216 .With charge treatment means

217 ..Exhaust gas recirculation

218 ..Rotor shape

219 ..Stratification

220 ..Preheating

221 .With transfer means intermediate single compression volume means and single expansion volume means

222 ..Isolated charge in movable transfer element

223 ..Reciprocating or oscillating compression volume means

224 ..Radially spaced from expansion volume means

225 ....Abutment acts as compression means

226 ....Compression means disposed in rotor

227 ....Vane acts as compression means

228 ..Compression volume means circumferentially disposed relative to expansion volume means

229 ..Transfer means in rotor

230 ...Compression volume is also expansion volume

231 ...Vane

232 ...Interengaging rotors

233 ...Nonparallel axes

234 ..Compression volume means axially disposed relative to expansion volume means

235 ..Transfer means in rotor

236 ...Vane

237 ...Abutment

238 ...Interengaging rotors

239 ..Compression volume means radially disposed relative to expansion volume means

240 ...Concentric

241 ..With compression, combustion, and expansion in a single variable volume

242 ..Planetating rotor

243 ...Vane

244 ..Abutment

245 ..Alternately approaching and receding elements

246 ...Eccentric interengaging rotors

247 ..Only combustion and expansion of charge in engine

248 ..Abutment

249 ..Interengaging rotors

18 R

OSCILLATING PISTON

18 A
.Toroidal cylinder

19

CONVERTIBLE CYCLE

INTERNAL COMBUSTION AND AIR

SOLID FUEL

GUNPOWDER

.Single shot gun powder motors

WATER AND HYDROCARBON

.Water in charge

.Water plus heat into charge

.Water into cylinder

.Water plus heat into charge

.Water introduced by mixing with other materials

.Water plus heat by mixing with other materials

.Washers and cleaners

.Washers and cleaners with heat

.Automatic water control

.Automatic water control; thermostatic

.Automatic water control; suction

.Automatic water control; speed

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25 N .Automatic water control interconnected with throttle
25 P .Steam injection
25 Q .Cooling regulation
26 ADDITIONAL AIR SUPPLY
250 ENGINE MEANS HAVING INTERNAL VAPORIZING IN PRECHAMBER WITH ALL COMBUSTION IN MAIN CHAMBER
251 .Whirling in prechamber
252 .Vaporizing by a hot surface of prechamber
253 PRECOMBUSTION AND MAIN COMBUSTION CHAMBERS IN SERIES
254 .Chamber temperature control means
255 .Vaporizing in precombustion chamber
256 .Plural precombustion chambers
257 .Two-cycle
258 .Having timed valves to precombustion and main combustion chambers
259 .Having volumetric relation between precombustion and main combustion chambers
260 .With ignition means particularly positioned relative to precombustion and main combustion chambers
261 .With injection means particularly positioned relative to precombustion and main combustion chambers
262 .Having fluid whirling means
263 ..Whirling in precombustion chamber only
264 .Precombustion chamber is carried by a valve
265 .Precombustion and main chambers form an "I" head
266 .Precombustion chamber assembly inserted in spark plug hole
267 ..Separate fuel or combustible mixture added to precombustion chamber
268 .Valveless precombustion chamber
269 .Piston shape complements precombustion chamber discharge
270 .Precombustion chamber liner or coating
271 ..With liner mounting means
272 ..Including combustion catalyst liner or coating means
273 .Precombustion chamber mounting means
274 .Having combustible mixture forming means
275 ..By fuel injection into precombustion or main combustion chamber
276 ..Fuel injected into precombustion chamber formed in piston
277 ..By fuel injection into precombustion chamber with carbureted main chamber
278 ..By fuel injection into main chamber with carbureted precombustion chamber
279 .Piston carried precombustion chamber
280 .Atomizer, deflector, or shield in precombustion chamber
281 .Precombustion chamber shape is a figure of revolution
282 ..Figure of revolution is multishaped to form a precombustion chamber
283 ..Cylindrical
284 ..Spherical
285 .Precombustion chamber having a specific shape
286 .Having specific connecting passage means between precombustion and main combustion chambers
287 ..With ignition means in connecting passage
288 ..Having fuel, a combustible mixture, or air added in the connecting passage
289 ..Fluid flow through passage controlled by working piston
290 ..With whirling
291 ..Multiple connecting passages
292 ..With valve means or variable orifice means in the passage
293 ..Having multiple passages
294 COMBUSTION CHAMBER MEANS HAVING FUEL INJECTION ONLY
295 .Combustible mixture stratification means
296 ..Injector is an integral part of engine valve
297 ..Combination igniting means and injector
298 .Injection of fuel onto igniter, deflector, heater, or atomizer
299 .Using multiple injectors or injections
300 ..Alternating multiple injectors (e.g., series injection)
301 .Injected fuel spraying into whirling fluid
302 .Air entering combustion chamber through plural inlets
303 ..Having inlet uncovered by working piston
304 .Injecting diverse fuels or different states of same fuel
305 .Having a particular relationship between injection and ignition characteristics (e.g., nozzle location, spray pattern, timing relative to igniter location, timing)

27 R \textit{BURNING BY HIGHLY COMPRESSED AIR}
27 GE .Gas engines (diesel type) convertible from liquid to gas or operable with liquid and gas

27 A .Oil engine air preheated

\section*{OIL ENGINES}
.Oil engine air preheated

\subsection*{COOLING}
.17 .Coolant released into cylinder or valve passages
.18 .Convertible
.19 .Refrigerating cycle
.2 .With vapor generation and/or condensing
.21 .Coolant circulation with condensing
.22 .Intake or carburetor connection
.23 .Entrained in secondary circuit
.24 .From top of jacket to bottom of radiator
.25 .Water bypasses condenser
.26 .Vapor only circulated
.27 .Overflow vent to condenser
.28 .Multiple cylinders with equalized cooling
.29 .Parallel flow
.3 .Mixed air and liquid
.31 .With cooling of additional parts or materials
.32 .With spark plug heat exchange
.33 .With lubricant heat exchange
.34 .Internal cooling of moving parts; e.g., hollow valves, pistons, and movable cylinder

\subsection*{Piston}
.35 .Piston

\subsection*{Telescoping piston and stationary conduits}
.36 .Telescoping piston and stationary conduits

\subsection*{Hollow piston rod}
.37 .Hollow piston rod

\subsection*{Wrist pin type; e.g., nonrigidly connected}
.38 .Wrist pin type; e.g., nonrigidly connected

\subsection*{Side wall opening}
.39 .Side wall opening

\subsection*{Interrelated shutter and throttle control}
.4 .Rotary valves
.41 .Poppet-type valves
.42 .Liquid coolants other than water and water treatment

\subsection*{Movably mounted tank or radiator}
.43 .Movably mounted tank or radiator

\subsection*{With liquid coolant circulating means}
.44 .With liquid coolant circulating means

\subsection*{Jet pumps}
.45 .Jet pumps

\subsection*{Common drive for pump and fan}
.46 .Common drive for pump and fan

\subsection*{Engine shaft driven}
.47 .Engine shaft driven

\subsection*{Devices for cooling liquid by air flow}
.48 .Devices for cooling liquid by air flow

\subsection*{Fan type}
.49 .Fan type

\subsection*{Yielding or resilient walls}
.5 .Yielding or resilient walls

\subsection*{Plural radiators and/or tanks in series}
.51 .Plural radiators and/or tanks in series

\subsection*{Engine or cylinder-mounted heat dissipators}
.52 .Engine or cylinder-mounted heat dissipators

\subsection*{Hopper type}
.53 .Hopper type

\subsection*{With vent}
.54 .With vent
41.55 Combined
41.56 Air-cooled
41.57 With liquid cooling
41.58 Flow-regulating means
41.59 Adjutable discharge
41.6 Steam dividing vanes, baffles, conduits, or the like for multiple cylinders
41.61 Individual deflecting cylinder baffles
41.62 Air duct with discharge ports or conduits
41.63 With impelling means
41.64 Jet type
41.65 Fan type
41.66 Suction
41.67 Jacketed cylinder
41.68 Spiral passages
41.69 Finned cylinder and/or head
41.7 Engine encasing air duct; e.g., cowling
41.71 Plural materials
41.72 With jacketed head and/or cylinder
41.73 Jet or spray within jacket
41.74 Multiple cylinder
41.75 Reentrant head
41.76 With cooled valve seats or guides
41.77 Poppet-type valves
41.78 Cylinder side wall valves
41.79 With passages, baffles, etc.
41.8 Spiral passages
41.81 Cylinder jacket supported solely by cylinder
41.82 With head-cooling arrangements
41.82 A Composite head
41.83 Cylinder detachable
41.84 Flanged cylinder or liner
41.85 Valve seats or guides
41.86 CRANKCASE VENTILATION
42 OSCILLATING CYLINDER
43 R ROTATING CYLINDER
44 R Radial
44 A Wheel
44 B Combustion chamber is center of star
44 C Two-cycle
44 D Valve casing-cylinders have no valves but have ports which register with ports in casing
44 E Cam transmission
43 A Parallel to shaft
43 AA Parallel to shaft cam track
43 B Toroidal cylinders
43 C Cam transmission
45 R ROTARY RECIPROCATING PISTON
45 A Piston and crankshaft coaxial
46 R FREE PISTON
46 A Two chambers; one piston
46 B Phasing means between two or more units
46 SC Single chamber; one piston
46 E Electric generating means
46 H Hammer
47 R VALVED PISTON
47 A Charge passes from crankcase through valve in piston
47 AA Lost motion connection actuates valve
47 AB Inlet and exhaust valve in piston
48 R ADJUSTABLE COMBUSTION CHAMBER
48 A Piston in head adjusted manually or mechanically
48 B Piston varied by means in crankshaft, connecting rod or piston
48 C Cylinder or sleeve-moving
48 D Auxiliary chamber
50 R RECIDCUTING CYLINDER
50 A Four-cycle
50 B Two-cycle
51 R MULTIPLE PISTON, COMMON
51 A .Four-cycle
51 AA .Four-cycle separate crankshaft for piston
51 AC .Two or more combustion chambers between the piston
51 B .Two-cycle
51 BA .Two-cycle separate crankshaft for piston
51 BB .Piston offset from crankshaft
51 BC .Plural combustion chamber and plural piston
51 BD .Inlet or exhaust ports in two or more planes
52 R MULTIPLE CYLINDER
52.1 .Simultaneous compression, distinct pistons, restricted communication to a single combustion chamber
52.2 .Four-stroke cycle
52.3 .Multiple crankshafts
52.4 .Two-stroke cycle
52.5 .Multiple crankshafts
52.6 .Multiple crankshafts

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53.1 Cylinder offset from crankshaft axis
53.2 Multiple crankshafts
53.3 Cylinders opposite
53.4 Two-stroke cycle
53.5 Crankshaft between parallel cylinders
53.6 Cylinders having opposing heads
54.1 Cylinders radiating
54.2 Star
54.3 Cam on rotary output shaft
54.4 "V" type
54.5 Odd number of cylinders
54.6 Six cylinder
54.7 Eight cylinder
54.8 More than eight cylinder
55.1 Semi-radial
55.2 Cylinders opposite
55.3 Cam on rotary output shaft
55.4 Four-stroke cycle
55.5 Cylinders opposite and aligned
55.6 Two-stroke cycle
55.7 Cylinders opposite and aligned
56.1 Having rotary output shaft parallel to cylinders
56.2 Cam on rotary output shaft
56.3 Swash plate type
56.4 Single bank of cylinders
56.5 Motion converting means between two banks of cylinders
56.6 Multiple swash plate drive
56.7 Single bank of cylinders
56.8 Motion converting means between two banks of cylinders
56.9 Multiple cam drives
57.1 Shaft rotates through piston
58.1 Cylinders in-line
58.2 Locked pistons
58.3 Two-stroke cycle
58.4 Lengthwise charging
58.5 Step piston
58.6 Step piston
58.7 Cylinder supercharged by pressure pulse of released exhaust gases
58.8 Exhaust to next cylinder ready to fire
58.9 Oscillating or reciprocating, nonpoppet valve
59.1 Rotary valve
59.2 Tapered
59.3 Sleeve valve
59.4 Disc valve
59.5 Plural carburetors
59.6 Multiple crankshafts
59.7 Two-stroke cycle
60.1 Locked annular piston

DOUBLE-ACTING
61 R Two-cycle
62 Combined pump and motor cylinder
61 V Lengthwise scavenging of cylinders from cylinder head to piston

SIX-CYCLE
62 TWO-CYCLE
63 Combined pump and motor cylinder
64 Divided pump discharge
65 R Pump compression
66 Separate air and gas pumps
67 V Lengthwise scavenging of cylinder by gas from cylinder head to piston

PUMP AND CYLINDER INJECTED
70 R Pump and cylinder adjacent
70 V Lengthwise scavenging of power cylinder
71 R Pump and cylinder coaxial
71 V Lengthwise scavenging of cylinder from head to piston
71 VA Sleeve valve
72 Pump and cylinder inclined

Rear compression
73 R Crankcase
73 A Fuel to crankcase
73 AA Ported piston
73 AV Valved
73 AB Inlet valve in head
73 AC Varies compression space
73 AD Lubricant oil and fuel mixing devices
73 AE Auxiliary piston moves synchronously with piston to enlarge volume of crankcase or incoming charge
73 AF Crankcase compression with auxiliary pump means
73 B Fuel to bypass
73 BA Lengthwise scavenging of cylinders from head
73 C Fuel to cylinder
73 CA Lengthwise scavenging of cylinders from head
73 CB With liquid pump to separate inlet
73 CC With gas or vapor pump to separate inlet
73 D ...Disc valves
73 DA ...Charge to crankcase through crankshaft
73 E ...Reentrant cylinder head
73 F ...Stepped piston
73 FA ....Ported
73 S ...Supercharging of crankcase
73 V ...Valves for crankcase
73 SC ...Returns charge to crankcase or rejects to exhaust
73 PP ...Distinct passages from crankcase to cylinder
73 SP ...Slow-speed operation
74 R ...Cylinder
74 A ...Fuel to rear of piston
74 AA ....Lengthwise scavenging from head
74 AP ...Reduced portion of piston acts as guide
74 AC ...Cross head between piston and crank
74 AE ...Enclosed crankcase
74 B ...Lengthwise bypass
74 C ...Lengthwise cylinder combustion space
74 D ...Slide valve between chamber of pump and crankcase
65 PE .Exhaust ports
65 A .Inlet and exhaust ports in two or more planes
65 B .Pumps
65 BA .Blowers
65 PD .Port deflectors
65 E .Scavenging by inertia of exhaust gas and charging by use of pressure waves
65 S .Step piston (see sub. 59 BS)
65 V .Valves
65 VA ...Sleeve valve
65 VS ...Sleeve driven by auxiliary crankshafts
65 VB .Lengthwise scavenging list above
65 VC .Lengthwise scavenging exhaust above
65 VD ...Intake and exhaust valve in top of cylinder
65 W ...Whirl through piston-controlled ports
65 WA ...Whirl in top of cylinders and lengthwise scavenging
65 WV .Vacuum intake
65 SP ...Single port for inlet and exhaust
65 EM .Exhaust manifolds

MEANS TO WHIRL FLUID BEFORE, UPON, OR AFTER ENTRY INTO COMBUSTION CHAMBER

65 P .Ports

MEANS TO WHIRL FLUID BEFORE, UPON, OR AFTER ENTRY INTO COMBUSTION CHAMBER

306 .Structural projection on working piston causes whirling
307 .Having multiple oxidant inlet means
308 .Specific spark plug location

COMBUSTION CHAMBER HAVING MULTIPLE SPARK GAPS

310 FOUR-CYCLE

311 .Engine cylinder having a reciprocating sleeve valve
312 ..Having a junk ring seal
313 ..Having sleeve valve lubrication means
314 .Multiple exhaust
315 .Having subcharger associated with the cylinder
316 .Crankcase compression of air or combustible mixture to be subsequently pumped into the working cylinder
317 .Rear compression of air or combustible mixture to be subsequently pumped into the working cylinder
318 .Scavenging
319 .Single revolution
320 .Variable clearance
321 .Piston in head adjusted mechanically
322 .Piston in head adjusted by fluid means
323 .Varying means is in the piston
324 .Varying means is in the piston connection
325 .Cylinder or sleeve moved
326 .Auxiliary chamber
327 .Varying means is in the connecting rod
328 .Varying means is in the crankshaft
329 .Single poppet valve
330 .Rotary valve and poppet which extends through rotary valve
331 .Concentric valves; relatively movable
332 .Rotating valve
333 .Rotary valve is perpendicular to cylinder
334 .Rotary valve is parallel to cylinder
335 .Sleeve valve
80 D  .Disc valve
80 DA  .Rotary plug
81 R  .Oscillating valve
81 B  .Oscillating valve - not sleeve or disc
81 C  .Sleeve valve
81 D  .Disc valve
82  .Rotating side shaft
83  .Rotating transverse shaft
84  .Adjacent supply and exhaust valves
85  .Aligned supply and exhaust valves
86  .Opposite supply and exhaust valves
87  .Longitudinal valve and lever
88  .Transverse valve and lever
89  .Transverse valve and bell crank

ENGINE SPEED REGULATOR
320  .Responsive to deceleration mode (e.g., engine acting as a brake)
321  .Valve timing altering means (e.g., axially sliding cam shaft)
322  ...Electrical means adapted to alter valve timing
323  ...Exhaust throttling or blocking
324  ...Part of the air or combustible mixture to the engine cylinder omitted
325  ...Deceleration responsive cutoff of fuel to engine (e.g., pollution control)
326  ...Rich resupply of fuel at end of deceleration
327  ...Auxiliary air fed to the engine
328  ...Idle jet bypassed by a slight opening of the throttle
329  ...Having means to retard spark (e.g., ignition timing)
330  .Engine speed reduction by overarching the combustible mixture (e.g., choking engine)
331  ...By electric means
332  .Engine speed reduction by fuel cutoff
333  ...By electric means
334  .Engine speed reduction by partial or complete omission of the ignition
335  ...By electric means
336  .Having plural throttle valve structure
337  .Specific throttle valve structure
338  .Fuel injection pump bypass control
339  .Idle speed control
339.1  .By regulating spark ignition timing
339.11  .And air-fuel ratio feedback controlled
339.12  .Manually adjustable
339.13  .Electrically operated control means
339.14  ...With fail-safe, backup, or malfunction detecting means
339.15  ...External load condition responsive
339.16  ....Air conditioner operating mode responsive (i.e., compressor on-off)
339.17  ....Accessory load (e.g., lights, heater blower motor, radiator fan motor, generator) on engine electrical system responsive
339.18  ....By engine speed error feedback
339.19  ...Dynamic state variable model
339.2  ...And integral or derivative control
339.21  ...And temperature responsive
339.22  ...Temperature responsive
339.23  ...Controlling throttle bypass
339.24  ...Stepping motor type
339.25  ...Including linear reciprocating solenoid control device
339.26  ...Including rotary actuator
339.27  ...Having valve controlled vacuum actuator
339.28  ...By overriding injection pump governor
339.29  ...By changing valve lift
340  .Regulator changes length of accelerator linkage
341  .Regulator accessory (e.g., cleaner, adjusting tool, etc.)
342  .Charge proportion varying (e.g., the fuel-air ratio is varied)
343  .By changing valve lift
344  .By Intake valve lift altered
345  .By changing valve timing
346  .By Intake valve timing altered
347  .Having condition responsive means with engine being part of a closed feedback system (e.g., cruise control)
348  .Having condition responsive means
349  .Electrical sensing or regulating
...Engine overspeed sensing with an indicator or alarm and speed regulation
...Engine speed sensing having an error signal producing circuit
...Having variable duty cycle multivibrator (e.g., length of "time on" in each cycle)
...Having variable frequency multivibrator (e.g., number of "time ons" per unit of time)
...Having phase difference detector
...Circuit resonates (e.g., tuned) at governed speed
...Electric fuel injection pump governor
...Max-min governor (i.e., no control in between)
...Fail-safe feature (e.g., cuts off fuel pump)
...Circuit controls a fluid throttle operator (e.g., vacuum)
...Circuit controls an electric throttle operator
...Cold engine control
...Mechanical sensor or regulator
...Fuel injection pump governor (e.g., diesel)
...Governor override
...Engine starting or warm-up control
...Variable throttle or control rod stop
...Three-dimensional cam control
...Acceleration responsive
...Deceleration responsive
...Biased axial link (e.g., sliding rod with spring return)
...Pivoted link connected to pump rack
...Movable fulcrum (e.g., slot and pin)
...Fuel injection pressure governor
...Throttle positioning
...Safety override of dangerous manual position
...Fluidic sensor or regulator
...Fuel injection pump governor
...Barometric sensor
...Fuel viscosity sensor (e.g., temperature sensing)

....Manifold pressure sensor
....Supercharger
....Floating piston-type governor (e.g., Bessiere)
....Liquid fluid governor
....Lubrication pressure sensor
....Fuel pressure sensor
....Override for basic mechanical governor
...Intake manifold vacuum responsive
...Fuel injection pressure governor
...Responsive to intake airflow
...Responsive to cooling fan airflow
...Responsive to exhaust gas
...By combustion air or air-fuel mixture cutoff
...Open loop condition responsive
...Resistance or override acts on input connection to regulator
...Shutdown safety device
...Throttle position lock
...Having an electrical device between input and speed regulator
...Mechanical connection between input and speed regulator
...Fluidic device between input and regulator
...Charge volume varying (e.g., total amount of mixture fed to engine is varied; relative amounts of air and fuel are fixed)
...Throttling (e.g., volume varying using throttle valve)
...Suction operated supply valve lift regulating
...By engine operated valve

SPARK IGNITION TIMING CONTROL
...Electronic control
...With fail-safe, backup or malfunction detecting means
...Including spark failure responsive means (e.g., misfire)
...Fuel sensor malfunction responsive
...Knock control malfunction responsive
...Cylinder pressure sensor malfunction responsive
406.18 ...Engine shaft rotational position sensor malfunction responsive (e.g., crank shaft, cam shaft)
406.19 ...Closed loop feedback control of spark timing
406.2 ...Separate control for each cylinder
406.21 ....Knock responsive
406.22 ....Cylinder pressure responsive
406.23 ...Engine output (e.g., torque, speed, horsepower) or fuel consumption optimization
406.24 ...Including means responsive to the instantaneous change in engine speed (e.g., roughness, unstable combustion, etc.)
406.25 ....Acceleration or deceleration responsive
406.26 ...Combustion condition responsive
406.27 ....Combustion failure responsive (e.g., misfire)
406.28 ....Combustion condition sensed by optical sensor
406.29 ....Engine knock responsive
406.3 .....Fuel quality or composition signal responsive
406.31 ......Alcohol concentration responsive
406.32 ......Having a plurality of speed/load maps related to fuel quality or composition
406.33 .....With modifying or updating memory (i.e., learning)
406.34 ......Modification of knock signal by engine operating condition signal
406.35 .....Engine operating condition is load or speed
406.36 ......Acceleration or deceleration responsive
406.37 ......Having specific knock detecting means
406.38 ......Knock frequency distribution pattern responsive
406.39 ......Knock signal counting
406.4 .....And specific system component mounting or location details
406.41 ....Engine cylinder pressure responsive
406.42 .....Peak pressure responsive
406.43 .....Responsive to derivative, integral or average of pressure
406.44 ...Exhaust gas condition responsive control of spark timing
406.45 ...Including control of combustible mixture or a constituent thereof (e.g., air, fuel, exhaust gas)
406.46 ...Acceleration or deceleration responsive
406.47 ...With fuel injection control
406.48 ...With exhaust gas recirculation (EGR) control
406.49 ..Barometric pressure responsive
406.5 ...Acceleration or deceleration responsive
406.51 ...Acceleration responsive
406.52 ..Throttle position responsive
406.53 ..Starting condition responsive
406.54 ...Start detected by engine speed
406.55 ..Temperature responsive (e.g., ambient, engine, etc.)
406.56 ..With magneto
406.57 ...And capacitor discharge for ignition spark energy
406.58 ..Having engine shaft rotational position signal generator (e.g., crank shaft, cam shaft)
406.59 ...Speed responsive timing control
406.6 ....Having counter or addressable memory (e.g., digital timing circuit)
406.61 .....Plural engine shaft position sensors
406.62 .....Position sensors at separate shafts
406.63 .....Position sensors having different pulse rates
406.64 ......Memory addressed by engine speed or load
406.65 ......With microprocessor
406.66 .....With resistor/capacitor (RC) timing circuit (e.g., multivibrator)
406.67 ..Vacuum timing control
406.68 ..Barometric pressure responsive
406.69 ..Condition responsive valve in fluid path from vacuum source
406.7 ...Temperature responsive
406.71 ..Fluid delay between vacuum source and actuator (e.g., fixed restriction)
CLASS 123 INTERNAL-COMBUSTION ENGINES

406.72 Increasing vacuum retards spark timing
406.73 Plural diaphragms or actuators
406.74 Mechanical or hydraulic link to throttle valve or accelerator
406.75 Centrifugal timing mechanism
406.76 Spark delay actuated or deactuated by starting device

COMBUSTION CHAMBER MEANS COMBINED WITH AIR-FUEL MIXTURE FORMING MEANS

429

430 Stratification in combustion chamber
431 Having a single combustible mixture inlet combined with means for injecting additional fuel into the combustion chamber
432 Air or combustible mixture entering the combustion chamber through plural inlets
433 One inlet is uncovered by piston travel

CHARGE FORMING DEVICE (E.G., POLLUTION CONTROL)

434 Including cylinder pressure or temperature responsive means
435 Including means responsive to instantaneous change in engine speed
436 Including exhaust gas condition responsive means
437 Acceleration or deceleration responsive
438 Exhaust gas temperature or pressure responsive
439 Combined with ambient condition responsive means (e.g., pressure)
440 Ambient temperature responsive
441 Combined with engine condition responsive means
442 Idling responsive
443 Engine load responsive
444 Acceleration or deceleration responsive
445 Throttle position responsive
446 Pressure downstream of throttle valve responsive
447 Starting or warmup responsive

...Engine coolant temperature responsive
...Speed responsive
...Inoperative sensor responsive
...Engine fluid or engine component temperature responsive
...With fail-safe, backup, or malfunction means
...Multiple sensors controlling group of cylinders
...Controlling plural groups of cylinders
...With compensator for sensor output (e.g., current or voltage)
...Output fed to compensating circuit
...Variable reference value
...Proportional or integral circuit
...Heater for sensor or sensor environment
...With addition of secondary fluid (e.g., fuel or exhaust gas)
...Secondary fluid is auxiliary air or oxygen (e.g., carburetor air bleed)
...Fed to air/fuel mixture
...With auxiliary control of carburetor
...Variable venturi carburetor
...Exhaust gas composition sensor
...Air/fuel ratio prior to combustion responsive means
...Auxiliary control of carburetor fuel metering
...By electrical or electronic control system
...Variable venturi carburetor
...By mechanical speed sensor
...Injection or carburetion system having a series of throttle valves
...Alternate or simultaneous lean-rich
...Having fluidic logic control means
...Fuel injection system
...Fuel pump flow regulation
...With accumulator
...Sequential distributor
...Rotary and reciprocating distributor
450 ....Rotary distributor
451 ....Reciprocating distributor
452 ....Nonsequential distributor
453 ....Enrichment of the combustible mixture for cold starting or cold running
454 ....Equal pressure valve type
455 ....Distributor and metering unit are in common housing
456 ....Common rail system
457 ....Regulating means adjusts fuel pressure
458 ....Electric regulator
459 ....Bleed off valve
460 ....Series regulator
461 ....Having vapor returned to tank or pump inlet
462 ....By throttle control
463 ....Manifold pressure responsive
464 ....Temperature responsive
465 ....Barometric responsive
466 ....Having an antitampering device
467 ..Drip prevention means at injector nozzle
468 ..Having a specific shape, material, or location of fuel line
469 ..Specific fuel line mounting means
470 ..Injection nozzle mounting means
471 ...Nozzle isolated from manifold vacuum effect
472 ..Electrically actuated injector
473 ..Mechanically actuated switching
474 ....Ignition distributor used as switch
475 ...Actuated by ignition pulse
476 ...Magnetically actuated switching
477 ...Radiation actuated switching
478 ...Actuator circuit (e.g., engine condition responsive electronic circuit actuates injector valve)
479 ....Backup systems, fail-safe, failure indicator
480 ....Having microprocessor
481 ....Engine cylinder cutout
482 ....Circuit activates valve for continuous fuel flow
483 ....Having plural multivibrators
484 ....Having single multivibrator
485 ....Having ramp generator
486 ....Having a digital memory addressed by an engine parameter
487 ....Having an up or up-down counter in circuit
488 ....Subcircuit operates on a parameter sensor output before input to main fuel control (e.g., function generator)
489 ....Injector solenoid drive
490 ....Starting condition responsive
491 ....Acceleration or full load condition responsive
492 ....Deceleration condition responsive
493 ....Having specific transducer
494 ..With fuel pump
495 ..Variable rate of injection stroke
496 ..Electric fuel pump
497 ..Piezoelectric drive
498 ..Solenoid drive
499 ..Variable beginning and ending of pumping stroke
500 ..Variable beginning of pumping stroke
501 ..Variable ending of pumping stroke
502 ...Fluid pressure control
503 ..Variable ending of pumping stroke
504 ..Variable stroke
505 ..Fuel pump and intake air controls interconnected
506 ..Having pressure relief valve
507 ..Pumping member driven by a piston or valve of the internal combustion engine
508 ..Pumping member driven by the internal combustion engine valve operating mechanism
509 ..Specific location or mounting of pump
510 ..Fuel flow regulation between the pump and the charge-forming device
511 ..Regulator means adjusts fuel pressure
512 ....Engine parameter responsive
513 ....Environmental condition responsive
514 ..Excess fuel returned to tank
515 ..Regulator controls flow of a plurality of fuels
516 ..Air or fuel vapor purging system
517 ..Carburetor float bowl drain

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Having fuel vapor recovery and storage system

Having an adsorbent canister

Purge valve controlled by engine parameter

Responsive to secondary air pressure

Liquid fuel evaporating by submerged air supply

Liquid fuel evaporating by extended fuel film

Screen or mat

Combined liquid and gaseous fuel

Diesel engine convertible from liquid to gas

Gaseous fuel and air mixer

Supercharged engine

Safety device (e.g., cutoff)

Constant flow fuel supply

Auxiliary air or gas used to inject fuel

Air is bled from the cylinder on the compression stroke in that cylinder

Having a separate pump for the air or gas

Air is bled from another engine cylinder

Constant fuel level

Combustible mixture ionization, ozonation, or electrolysis

Before intake valve (e.g., in manifold)

Fuel only

Air only

Cooling of combustible mixture

Fuel only

Air only

Heating of combustible mixture

Lighter fuel is used during starting

Heating medium surrounds combustible mixture

Combustible mixture surrounds heating medium

Combustible mixture and heating medium adjoin one another

Trap for liquid particle vaporization

Electric heater

Combustion heater

Part of combustible mixture is burned

Automatic control

Intermediate fluid used for heating

Combustible mixture, air, and fuel are heated separately

Air and fuel heated separately

Air only

Fuel only

Fuel is heated to ignition temperature

Pressure exchange with exhaust gas

With clutch

Two-cycle compressor feeds a four-cycle engine

Variable ratio compressor driven supercharger

Multiple superchargers

Intercooler

Boost control

Supercharger is driven independently of the engine

Funnel-type supercharger (e.g., ram-air)

Oxidant is solely oxygen

Exhaust gas used with the combustible mixture (e.g., emission control Exhaust Gas Recirculation (EGR) valve)

Exhaust gas cooled during recirculation

Having recirculation path formed entirely in the cylinder block or head

Internal exhaust gas recirculation (e.g., exhaust gas retained in the combustion chamber)

Having exhaust gas mixed with a constituent before entry into intake manifold

With electrical means for fail-safe, backup, or malfunction detecting of EGR system

Having specific exhaust gas outlet structure at intake manifold

Having a valve located at the outlet of the EGR passage

EGR valve position controlled only in relationship to intake throttle valve position

Plural EGR valves in the recirculation passage
568.21 Having electrically actuated control means
568.22 Ambient condition responsive (e.g., atmospheric temperature, atmospheric pressure)
568.23 Having rotary actuator control of EGR valve
568.24 Electrical rotary actuator rotates the EGR valve
568.25 Vacuum actuator control of EGR valve
568.26 Having electromechanical actuator control of EGR valve
568.27 Controlling vacuum actuator
568.28 Including auxiliary vacuum pump
568.29 Vacuum actuator control of EGR valve
568.3 Including auxiliary vacuum pump
568.31 Temperature responsive
568.32 Having fixed restriction in vacuum line
572 Crankcase vapor used with combustible mixture
573 Vapor treated before mixing with combustible mixture (e.g., cooling)
574 Specific control valve (e.g., PCV valve)
575 Diverse fuel supply
576 Fuel switched in response to engine starting condition
577 Fuel switched, condition responsive to load
578 Fuel switched in response to engine temperature
579 Multiple carburetors
580 Each carburetor feeds a cylinder or group of cylinders (e.g., split engine)
581 Separate carburetor for starting
582 Separate carburetor for high load
583 With linkage between carburetor throttle valves
584 Staged opening of carburetor throttle valves
585 Auxiliary air or oxygen added to combustible mixture
586 Oxidant controlled by throttle manifold vacuum
588 Oxidant controlled by engine temperature
590 Charge-mixing device in intake (e.g., device which insures the atomization of the combustible mixture)
591 Having liquid fuel collector
592 By fan means
593 By screen means

HIGH TENSION IGNITION SYSTEM
595 Retrofit conversion ignition unit
596 Using capacitive storage and discharge for spark energy
597 Regulating sensed ignition capacitor voltage
598 Having an oscillator
599 Having a magneto
600 Triggering voltage obtained from capacitor charging winding
601 Specific design of charge or trigger winding core
603 Antireverse protection
604 Inductive capacitive discharge system
605 Having a specific capacitor, ignition coil means, or switching element circuit path
606 High frequency ignition system
607 Free running oscillator supplies coil primary
608 Having a specific spark plug
609 Having dwell control
610 Using a monostable multivibrator
611 Dwell maintained at constant value
612 Having engine component position sensor
613 Optical sensing
614 Including a zero crossing detector
615 Including an oscillator
616 Piezoelectric sensor
617 Inductive or magnetic sensor
618 Having specific trigger circuitry
619 Oscillatory trigger circuit
620 Additional spark energy supply
621 Having an ignition coil with multiple primary or secondary windings
622 Separate circuit for each winding
Having supply voltage regulation
Having ballast resistor cutout or control
Responsive to engine or environmental condition
Oscillator or trigger circuit responsive to engine condition
Having auxiliary spark gap in series or parallel with the coil
Having a continuous high voltage output to the high voltage distributor
Monostable multivibrator controls timing of coil primary current
Safety device
Reverse engine rotation protection
Ignition switch opened when engine stops
Radio interference protection
Having a specific ignition coil
Specific coil location
Multiple spark ignition system
System fires single spark plug per cylinder
System fires multiple spark plugs per cylinder
System using vibrator for multiple sparks upon starting
Dual systems
One for starting
Piezoelectric voltage generator
Electronic cylinder sequencing
Current or voltage sensing in coil primary
Maverick spark suppressor
Point bounce or arc suppression system
Having a specific mounting of system component
Having SCR triggered by lowering cathode voltage below ground
Multiple primary current interrupters
Power supply, ignition coil primary, and interrupter element all in series
Interrupter is multiple transistor circuit
Interrupter is single transistor

Additional capacitor other than breaker point capacitor is in series with coil primary or secondary
Additional capacitor other than breaker point capacitor is in parallel with coil primary or secondary
Diode is in series with coil primary or secondary
Diode is in parallel with coil primary or secondary

Poppet Valve Operating Mechanism
Electrical system
Hydraulic system
With manifold and distributor
Pneumatic system
With means for varying timing
Cam-to-valve relationship
Camshaft or cam characteristics
Axially shiftable camshaft
With temperature compensation
With compound movement of cam follower

Electrical system
Hydraulic system
With manifold and distributor
Pneumatic system
With means for varying timing
Cam-to-valve relationship
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Electrical system
Hydraulic system
With manifold and distributor
Pneumatic system
With means for varying timing
Cam-to-valve relationship
Camshaft or cam characteristics
Axially shiftable camshaft
With temperature compensation
With compound movement of cam follower
90.45 ..Lash adjustment
90.46 ...Hydraulic
90.47 ...Yieldable engagement
90.48 ...Tappet
90.49 ...Cushion and silencer
90.5 ...Rotation prevention
90.51 ...Composition, surface treatment
90.52 ...Lash adjustment
90.53 ...Self-operating
90.54 ...Screw
90.55 ...Hydraulic
90.56 ...Pressure flow upwardly into pressure chamber
90.57 ...Vent or bleed means for pressure chamber
90.58 ...Self-contained
90.59 ...With provision for horizontal positioning
90.6 ...Cam
90.61 ...Rod
90.62 ...Self-adjusting
90.63 ...Hydraulic
90.64 ...Pull type
90.65 ...Spring
90.66 ...Attenuated
90.67 ...Seat and retainer
143 R IGNITERS
144 ...Flame
145 R ...Incandescent
146 ...Valve controlled
145 A ...Electric (incandescent igniters using electricity as a source of heat)
146.5 R ...Sparkers
147 ...Low tension
149 R ...Dynamos
149 A ...Inductor type
149 B ...Impulse starters
149 D ...Flywheel type
149 E ...Oscillating armature type
149 F ...Special waveforms
149 FA ...Double current generators
149 G ...Movable pole shoes and bell-magnets
149 H ...Reciprocating
150 ...Combined adjusting and exhaust regulating
151 ...Combined sparker and valve
152 ...Combined valve and sparker operating
169 R ...Plugs
169 CL ...Cleaners automatic
169 CM ...Cleaners manual
169 CA ...Compound insulation
169 CB ...Core retaining
169 DW ...Disk wrappings type
169 EL ...Electrodes
169 EA ...Adjustable gap
169 EB ...Replaceable electrode
169 EC ...Adjustable and replaceable
169 C ...Cool
169 E ...Insulated electrodes
169 G ...Intensity in gap only
169 P ...Insulating protecting
169 PA ...Tubes and attachments
169 PB ...Heaters
169 PH ...Hoods and shields
169 MG ...Multiple firing gap
169 TC ...Transparent combustion chamber
169 V ...Valved
153 ...Make and break
154 ...Electromagnetic
155 ...Pneumatic
162 ...Piston-operated
156 ...Reciprocating electrode
157 ...Rocking-electrode hammer action
158 ...Rocking and rigid electrodes
159 ...Rocking and yielding electrodes
160 ...Oscillating electrodes
161 ...Rotary electrodes
163 ...Stationary-electrode structure
164 ...Adjusting mechanism
146.5 A ...Timers
146.5 B ...Ignition locks
146.5 C ...Fluid level or pressure-actuated ignition switches
146.5 D ...Devices for opening the ignition circuit when engine stops in order to save battery
143 A ...High compression igniters
143 B ...Special charge igniters
143 C ...Insulated casing enclosing wires leading to plugs, distributor, etc.
192.1 VIBRATION COMPENSATING DEVICE
192.2 ...Balancing arrangement
197.1 TRANSMISSION MECHANISM FROM PISTON
197.5 ...Including clutch
197.2 ...With particular piston
197.4 ...Crankshaft and connecting rod
197.3 ...Particular connecting rod
179.1 STARTING DEVICE
179.2 ...Remote control

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CLASS 123 INTERNAL-COMBUSTION ENGINES

179.3 .Condition responsive control of starting device
179.4 .Including automatic engine stop
179.5 .Control of spark ignition during starting
179.6 .Control of glow plug during starting
179.7 .Auxiliary fuel supply device
179.8 .Starting fluid
179.9 .Priming means
179.11 .Manual pump device or squeeze bulb
179.12 .Condition responsive
179.13 .Temperature
179.14 .Condition responsive
179.15 .Temperature
179.16 .With fuel or intake air control
179.17 .Fuel injection pump
179.18 .Intake air control
179.19 .Includes auxiliary internal combustion engine
179.21 .With charge or cylinder heating
179.22 .Inertia type
179.24 .Either power or manual starting device
179.27 .For airplane
185.7 .Manual type
185.28 .With electric generating means
185.29 .Auxiliary magneto
185.31 .Having fluid-driven starting motor
183.1 .Gunpowder type
182.1 .Compression relieving type
179.25 .Having specific mounting or drive connection for electric starter motor
183.41 .Multiple passage leading to inlet of one cylinder
183.47 .Manifold having plenum
184.48 .Plural plenums
184.49 .Interconnection between plenums
184.13 .Means provided to prevent counter rotation of crank
184.21 .INTAKE MANIFOLD
184.22 .Passage to crankcase
184.23 .For use with carburetor upstream of manifold
184.24 .Manifold having plenum
184.25 .Plural plenums
184.26 .Interconnection between plenums
184.27 .Multiple passage leading to inlet of head
184.28 .For engine having radiating cylinders
184.29 .Star-type engine
184.31 .For V-type engine
184.32 .For use with carburetor upstream of manifold
184.33 .Inlet manifold heated by outlet manifold
184.34 .Manifold having plenum
184.35 .Plural plenums
184.36 .Interconnection between plenums
184.37 .Multiple passage leading to inlet of one cylinder
184.38 .For in-line engine
184.39 .For use with carburetor upstream of manifold
184.41 .Intake manifold heated by outlet manifold
184.42 .Manifold having plenum
184.43 .Plural plenums
184.44 .Interconnection between plenums
184.45 .Multiple passage leading to inlet of one cylinder
184.46 .For use with carburetor upstream of manifold
184.47 .Manifold having plenum
184.48 .Plural plenums
184.49 .Interconnection between plenums
184.51 .Adjustable plenum
184.52 .Multiple passage leading to inlet of one cylinder
184.53 .Manifold tuning, balancing or pressure regulating means
184.54 .With back flow prevention valve
184.55 .Adjustable length passage
184.56 .Adjustable cross section passage
184.57 .Resonator chamber

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184.58 . ..Return loop to inlet
184.59 . ..Interconnection between passages
184.61 . Manifold material or composition
142.5 E . Electric heaters for heating cooling system
657 . COMBUSTION CHAMBER
658 . L- or T-shaped
659 . Having groove to aid combustion
660 . An acoustic cavity used to attenuate detonation shock waves (e.g., Bodine)
661 . Having squish area
662 . Multiple annular combustion chambers
663 . Annular combustion chamber
664 . Combustion chamber shape is a figure of revolution
665 . Spherical
666 . Hemispherical
667 . Asymmetric combustion chamber
668 . Having coating or liner
669 . With means for mounting coating or liner
670 . Having catalytic combustion aid
671 . Cylinder head shape conforms to piston shape
193.1 PARTICULAR PISTON AND ENCLOSING CYLINDER CONSTRUCTION
193.5 . Cylinder head
193.3 . Having detail of connection to other cylinder structure
193.6 . Piston
193.4 . Having detail to guiding structure cooperating with cylinder
193.2 . Cylinder detail
188.1 VALVE
189 . Detachable
188.14 . Valve head cooperates with manifold
188.4 . Reciprocating valve
188.15 . Shepherd type
188.2 . Poppet
188.16 . Pivoted
188.3 . Material or structure
188.5 . Sleeve
190.1 . Rotary
190.12 . Sleeve
190.13 . With lubrication means
190.3 . For crankcase
190.4 . Double function type
190.5 . For two or more cylinders
190.6 . Elongated rotary double-function valve
190.7 . Tapered
190.8 . In horizontal plane above cylinder
190.9 . Tapered
190.11 . In horizontal plane on the side of the cylinder
190.14 . Disc, cone, or sphere shaped
190.15 . Controls plural cylinders
190.2 . Single function, (i.e., exhaust and intake by separate tube)
190.16 . Lubricant
190.17 . Seal
188.6 . Packing
188.7 . Combustion improving accessory
188.8 . Valve seat relation
188.9 . Guide, lubricant, or coolant
188.11 . Wear feature
188.12 . For spring
188.13 . Including attaching means
188.17 . Having actuation springs concentric with valve stem
195 R FRAME CONSTRUCTION
195 A . Auxiliaries, brackets
195 C . All covers
195 E . Electrical
195 P . Outboard motor frames
195 S . Sheet metal frames
195 AC . Inclined cylinder
195 H . Horizontal stress members
195 HC . Horizontal cylinder
196 R LUBRICATORS
196 A . Filtering
196 CP . Crankcase, pressure control
196 AB . Heating and cooling
196 M . Upper cylinder lubricants
196 S . Safety devices
196 V . Sleeve valve lubrication
196 W . Vertical shaft
198 R ACCESSORIES
198 A . Decarbonizers and antiknocks
198 B . Antitheft valves and locks
198 C . Pumps
198 D . Safety devices
198 DA . Bearing wear, cylinder, oil drain, auto ignition
198 DB . Fuel cut-off
198 DC . Ignition cut-off control
198 E . Covers, trays, vibrators, corrosion inhibitors, air filters
198 F . Cylinder cut out
FOREIGN ART COLLECTIONS

FOR 000 CLASS-RELATED FOREIGN DOCUMENTS

Any foreign patents or non-patent literature from subclasses that have been reclassified have been transferred directly to FOR Collections listed below. These Collections contain ONLY foreign patents or non-patent literature. The parenthetical references in the Collection titles refer to the abolished subclasses from which these Collections were derived.

STARTING DEVICE

FOR 100 .Spark delaying (123/186.1)
FOR 101 SPARK IGNITION TIMING CONTROL (123/406)
FOR 102 .Vacuum timing control (123/407)
FOR 103 .Multiple diaphragms (123/408)
FOR 104 ..Fluid delay in fluid path line from vacuum source (123/409)
FOR 105 ..Including sensor responsive to barometric pressure to alter vacuum level (123/410)
FOR 106 ..Increasing vacuum retards the spark (123/411)
FOR 107 .Barometric pressure responsive controller (123/412)
FOR 108 .By mechanical or hydraulic link to throttle valve or accelerator (123/413)
FOR 109 .Having engine shaft position sensor (123/414)
FOR 110 .Analog electronic control (123/415)
FOR 111 .Digital electronic control (123/416)
FOR 112 ..Having microprocessor (123/417)
FOR 113 .Speed responsive (123/418)
FOR 114 ..Responsive to instantaneous changes in engine speed (e.g., roughness) (123/419)
FOR 115 ..Centrifugal timing mechanism (123/420)
FOR 116 .Ambient or engine temperature responsive (123/421)
FOR 117 .Acceleration responsive (123/422)
FOR 118 .Deceleration responsive (123/423)
FOR 119 .Starting or cold running condition responsive (123/424)
FOR 120 .Cylinder pressure or cylinder temperature responsive (123/425)
FOR 121 .Feedback correction (123/426)
FOR 122 .Timing control derived from ignition capacitor (123/427)
FOR 123 .Having circuit that alters response of an oscillatory engine shaft position sensing circuit (123/428)
FOR 124 .Exhaust gas used with the combustible mixture (e.g., emission control (e.g., valve) (123/568)
FOR 125 ..Diesel engine (123/569)
FOR 126 ..Exhaust gas cooled before recirculation (123/570)
FOR 127 ..Electrical control of e.g.r. valve (e.g., between exhaust gas and intake manifold) (123/571)
FOR 128 ...Having controllable timing means (123/602)

DIGESTS

DIG 1 INTERCHANGEABLE
DIG 2 ACCUMULATED FUEL RETURN TO TANK OR ENGINE-INDUCTION SYSTEM
DIG 3 MODEL
DIG 4 STRATIFICATION
DIG 5 CRANKCASE PRESSURE-OPERATED PUMPS
DIG 6 DETACHABLE
DIG 7 CONVERTIBLE
DIG 8 MULTIPLE ENGINE UNITS
DIG 9 FLAME IGNITION
DIG 10 FLUIDIC AMPLIFIER FUEL CONTROL
DIG 11 ANTIDIESELING (STOPPING)
DIG 12 HYDROGEN
DIG 13 GAS