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⑦① Applicant: **Yang, Tai-Her, 5-1 Taipin Street, Si-Hu Town**
Dzan-Hwa (TW)

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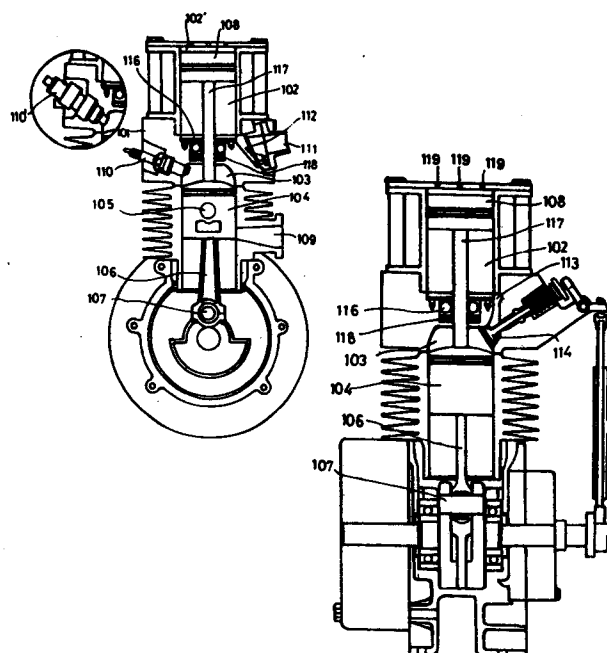
⑦② Inventor: **Yang, Tai-Her, 5-1 Taipin Street, Si-Hu Town**
Dzan-Hwa (TW)

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⑦④ Representative: **Arthur, Bryan Edward, Withers &**
Rogers 4 Dyer's Buildings Holborn, London EC1N 2JT
(GB)

⑤④ **A reciprocating internal combination engine including a separate gas chamber.**

⑤⑦ The engine according to the invention comprises a cylinder body (101) including at least one power piston/cylinder combination (104, 103) and at least one auxiliary piston/cylinder combination (108, 102) with the said combinations disposed in coaxial relationship, a separating wall disposed between adjacent piston/cylinder combinations, a connection rod (117) coaxially interconnecting the pistons (104, 108) for synchronous movement thereof between top- and bottom-dead-centre positions of the pistons and sealingly passing through said separating wall or walls, a connecting rod (106) and crank-shaft for converting reciprocal motion of the said combination into a rotational output, an exhaust port (109) for discharging exhaust gases from the power cylinder (103) when the power piston (104) is in the region of bottom-dead-centre, an inlet port (111) including a one-way valve (112) in communication with at least that auxiliary cylinder (102) adjacent the power cylinder, means for controlling operation of the said one-way valve (112) in accordance with the engine firing cycle, a gas transport passage (113) interconnecting a power cylinder (103) and an adjacent auxiliary cylinder (102), and a valve (114) for controlling transportation of gas through the passage (113), a gas pump chamber (102') disposed on at least that side of an auxiliary piston (108) remote from an adjacent power piston (104) for compressing gaseous media, and means (110, 110') for igniting a fuel/gas mixture in each power cylinder or injecting fuel into each power cylinder.



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A RECIPROCATING INTERNAL COMBUSTION ENGINE INCLUDING A SEPARATE GAS
CHAMBER.

This invention relates to a reciprocating internal combustion engine including a separate gas chamber.

SUMMARY OF THE INVENTION:

The applicant has improved the various compatible application
5 example defined in the claim No: 8420682 to some machine structure types
and its application structures based on the design principle of the
separate gas chamber defined in the original case. The various types have
their individual suitable situation. It comprises mainly the equipment of
the pressure input gas chamber on the upper section and its relative
10 auxiliary intake and exhaust structure for the supplement of the
uncompletonal parts defined in the original case and furthermore to show
the fluid pump function for the air, water or oil using the space formed
by the piston back side of the pressure input gas chamber as well as the
electrical generating function by means of the direct drive.

15 According to the present invention there is provided a reciprocating
internal combustion engine comprising a cylinder body including at least
one power piston/cylinder combination and at least one auxiliary piston/
cylinder combination with the said combinations disposed in coaxial
relationship, a separating wall disposed between adjacent piston/cylinder
20 combinations, a connection rod coaxially interconnecting the pistons for
synchronous movement thereof between top- and bottom-dead-centre positions
of the pistons and sealingly passing through said separating wall or
walls, a connecting rod and crankshaft for converting reciprocal motion
of the said combination into a rotational output, an exhaust port for
25 discharging exhaust gases from the power cylinder when the power piston
is in the region of bottom-dead-centre, an inlet port including a one-way
in valve in communication with at least that auxiliary cylinder adjacent
the power cylinder, means for controlling operation of the said one-way
valve in accordance with the engine firing cycle, a gas transport passage
30 interconnecting a power cylinder and an adjacent auxiliary cylinder, and a
valve for controlling transportation of gas through the passage, a gas pump
chamber disposed on at least that side of an auxiliary piston remote from an
adjacent power piston for compressing gaseous media, and means for igniting
a fuel/gas mixture in each power cylinder or injecting fuel into each power
35 cylinder.

BRIEF DESCRIPTION OF THE DRAWINGS:

Fig. 1 is the sectional diagram I of the application example of the back and forth motion type of the internal combustion engine with the separate gas chamber.

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Fig. 1-1 is the sectional diagram II of the application example of the back and forth motion type of the internal combustion engine with the separate gas chamber.

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Fig. 2-1 is the diagram of the intake travel.

Fig. 2-2 is the diagram of the pressure and ignition travel.

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Fig. 2-3 is the diagram of the explosion and move force travel.

Fig. 2-4 is the diagram of the exhaust travel.

20

Fig. 2-5 is the diagram of an application example of the combustible gas transport using the upper and lower hollow piston rod with the transport holes.

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Fig. 2-6 is the diagram of an application example of the separate chamber engine with the upper and lower double pressure input chamber and the outer pressure reservoir.

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Fig. 2-7 is the sectional diagram of Fig. 2-6.

Fig. 3 is the diagram of an application example of the gas pump using the upper piston.

5 Fig. 4 is the diagram of an application example of the drive turbine pressurizing equipment using the upper piston drive pump.

10 Fig. 4-1 is the diagram of an application example of the separate gas chamber engine with the gas input pressurizing three sectional piston.

Fig. 4-2 is the sectional diagram of Fig. 4-1.

15 Fig. 5 is the diagram of an application example of the liquid pump using the upper piston.

20 Fig. 6 is the diagram of an application example of the linear electric generation engine with the outer cycle generator winding coupled with the upper piston.

Fig. 6-1 is the diagram of an application example of the pole coupled with the upper piston.

25 Fig. 7 is the diagram of an application example of the linear electric generation equipment couples with the gas chamber engine with the pump drive function.

30 Fig. 8 is the diagram of the application example

of the linear electric generation equipment coupled with
the upper side of the traditional piston engine.

5 Fig. 8-1 is the diagram of an application example
of two ways fluid pump coupled with the upper side of
the traditional pump engine.

10 Fig. 8-2 is a diagram of an application example
of two ways pump coupled with the upper side of the
traditional pump engine.

15 Fig. 8-3 is the diagram of an application example
of two ways and respective independent fluid pump
coupled with the traditional pump engine.

Fig. 9 is the diagram of an application example
of the separate gas chamber engine with the different
cylinder diameters.

20 Fig. 9-1 is the sectional diagram of Fig. 9.

Fig. 10 is the diagram of an application example
of one unit type two travel pump with the different
cylinder diameters.

25 Fig. 10-1 is the sectional diagram of Fig. 10.

30 Fig. 11 is the diagram of an application example
of one unit type four travel pump with the different
cylinder diameters.

Fig. 11-1 is the sectional diagram of Fig. 11.

DETAILED DESCRIPTION OF THE INVENTION:

5 The applicant has explained the constructive type
and the advantage of the claim No. 8420682. Now he
does improve the structure type for the pressure
input gas chamber. The advantage of this type is
shortening of the crank length and its stationary. It
is the improvement of the original structure. Fig. 1
10 & 1-1 are the example of its application. We describe
them in detail as follows:

15 In Fig. 1 & 1-1, a cylinder block 101 has each
cylinder gas chamber 102, 103 on the upper and lower
sides. The lower cylinder block is equipped with a lower
piston 104 which can endure the explosion pressure and
with a bias link pin 105 which can move the bias crank
shaft 107 and cause rotative output.

20 -- The upper piston 108 locates between the upper
cylindric gas chamber 102 and the lower piston. Using
a piston link 117, the both parts connect each other.
The phase relationship of both parts is synchronized,
including the reach to the stop point and to the lower
25 stop point at the same time. In Fig. 1, the exhaust
opening 109 locates at the lower stop point in the
lower gas chamber.

30 -- The ignition plug 110 is equipped in the near of
the top of the lower gas chamber. When we use jet oil

inlet 110', only fresh airs can come into the pressure input gas chamber.

5 -- The intake opening 111 is equipped in the near of the lower stop point in the upper gas chamber 102. It is equipped with a single way valve 112.

10 -- The end of the gas transport opening of the combustion gas transport way 113 is equipped in the near of the lower stop point in the upper gas chamber. Its another end is equipped at the top point of the lower gas chamber and is located diagonally with the exhaust opening.

15 -- The intake piece 114 is used for the control of the opening and closing of the gas transport way. This intake piece is controlled by the synchron mechanism, such as bias wheel on the flange shaft, synchron toothed belt and synchron bias gear. When
20 the lower piston 104 returns from the near of the lower stop point to the upper stop point. It is opened and let the combustion gas come into the lower gas chamber 103 used for the combustion chamber.

25 -- A gas pump chamber 102' is formed among the upper side of the upper piston 108 and the upper section of the upper gas chamber and the back side of the upper piston. Excepting the equipment of a gas opening 119 for the advance of the block, it can be also equipped
30 with the additional inlet valve and outlet valve to

form a pump for the pump using in the water, oil or gas, or for the movement of a pressurizing turbine.

5 -- The ignition coil can ignite the combustion gas,
when the lower piston 104 has reached the upper stop
point. When the engine is running, the combustion gas
comes into the upper gas chamber 102 through the intake
opening 111 and the single way intake valve 112 due
to upward pump of the upper piston 108. When the
10 upper piston 108 pumps downward and the combustion gas
is compressed and stirred in the near of the lower stop
point, the intake piece 114 is opened, the combustion
gas comes into the lower gas chamber 103 through the
combustion gas transport way 113 and pushes the exhaust
15 gas through the exhaust opening to the open air. When
the lower piston 104 returns to the upper stop point,
the ignition coil let the ignition plug 110 ignite and
let the fresh combustion gas exploide. At this time,
the upper piston 108 has the finished gas input and
20 is prepared for the compression.

25 -- Cooling opening 116 is used for the pump cooling
fluids which can cool the oil seal 118 coupled with
the upper and the lower piston link 117, the outer
oil tank, the cooling fan or the liquid pump, the
cooling liquid tank and the start motor...etc. For
its movement process, please refer to Fig. 2-1, 2-2,
2-3 & 2-4.

30 Furthermore, the gas intake type connected from

the upper gas chamber into the lower gas chamber with the above-said engine structure can be reached by the following method: As defined in Fig. 2-5, the upper piston link and the lower piston hollow link 201 have the hollow pipe, in which an intake opening 202 at the upper end and an exhaust opening 203 at the lower end. The time of the intake starting is decided by the position selection of the lower exhaust opening 203.

As defined in Fig. 2-6 and 2-7, the body structure is same as the diagram, but two sides of the upper piston 208 form two intake gas chambers separately with the upper gas chamber 204 and the upper section of the upper gas chamber 204', in which the upper gas chamber 204 is equipped with a single way intake opening valve and a single way exhaust opening valve 206 and a gas pump chamber 204' formed by the upper section of the upper gas chamber and the back side of the upper piston is equipped with a single way intake opening valve 205' and a single way exhaust opening valve 206'. Two intake opening valves 205 and 205' are connected separately with a carburetor. Two exhaust opening valves are connected separately with a pressure reservoir 207. This pressure reservoir is used for the acceptance of the compressed combustion gas pumped upward and downward by the upper piston for the increament of the gas intake density. The space between the output opening of the pressure reservoir and the combustion chamber is used for the acceptance of the combustion gas controlled synchronously by the steam valve piece.

If the feed oil of this engine is changed to the jet feed oil, the fresh air is intaked and compressed, and the oil is feeded directly by the jet nozzle.

5 The advantages of the above-said design are as follows:

10 1. The intake opening is located diagonally with the exhaust opening. Therefore, the elimination of the waste gas is easier and its combustion gas has less than the traditional two travel engine intake and exhaust openings. Thus the combustion efficiency and the engine power are increased.

15 2. The curved shaft and the piston lubrication system can use the semi-closed dipping type, so that the combustion oil system is separated from the lubrication system. Therefore, it is not need to add the mixture of the lubrication oil and the motor
20 oil to gasoline due to the transport of the combustion gas through the curved shaft tank as the traditional two travel engine. Thus the smog pollution after the combustion can be avoided.

25 3. It needs less parts and has the simple structure.

30 4. A pump function is formed by the upper gas chamber and the upper piston. Therefore, it can be used as the fluid pump, when we use the single way intake valve and the exhaust valve. As the application

example defined in Fig. 3, it uses a compression air pump and is lacking the transmission system and the independent gas pump cylinder which is needed in the traditional engine drive air compression. Therefore,
5 it can reduce the costs and can increase the efficiency.

Its all application structures are shown as follows:
In Fig. 3, 301 is the intake valve, 302 is exhaust valve equipped at the upper side of the upper gas
10 chamber or on the upper cover, 303 is air filter connected to the front of the intake valve, 304 is pressure reservoir connected with the exhaust valve, 305 is the pressure reducing valve connected with the pressure reservoir, 306 is pressure manometer. The above-said
15 parts form an air compressor system for driving the air drive apparatus.

Its application can be made by the direct drive of the turbine pressurizer using above-said air pressure,
20 as defined in Fig. 4. In Fig. 4, 401 is an air drive turbine equipment, its air pump outlet 402 is coupled with the intake opening 403. The gas pump inlet 404 is connected with the carburetor. The upper section of the upper gas chamber and each side of the upper
25 piston 406 form a gas pump chamber 405, the pump inlet 407 is equipped with the single way valve 408, the pump outlet is connected with the drive inlet 409 of the turbine equipment and its output goes through the outlet 410, so that the intake pressure increases during
30 the running of the engine. Its function is same as the various used turbine pressurizing equipment. If we

various used turbine pressurizing equipment. If we use the fluid to drive the turbine pressurizing equipment. the same function will be shown.

5 The intake pressurizing of the above-said engine can be described in Fig. 4-1 and 4-2. Using the third piston 421 over the upper piston and the third cylinder 422 equipped at the same time, the gas pump function is formed by the above formed double gas chambers 423 and 424. Adding the original piston 425 and the upper section of the upper gas chamber 426 to them, a gas pump is formed. The later can input the pressurizing combustion gas into the pressure reservoir 427. Each intake opening of the above-said pump chamber is equipped separately with the single way valves 428, 429 and 430 for the input of the combustion gas come from the carburetor. Each outlet is equipped also separately with the single way valve 431, 432 and 433 for the connection to the pressure reservoir 427.

10 There is a single way valve 434 between the pressure reservoir and the main pressurizing gas chamber 435 compressed twice. A intake door which can be adjusted is located between the main pressurizing gas chamber 435 and the combustion chamber. It can control the intake time. During the driving, the air should be pre-compressed in order to increase the intake quantity and output power. Excepting the intake pre-compression, the further process is same as which described in Fig. 1.

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Fig. 5 shows it is used as the liquid pump. The filter 501 is used for the filtration of the input fluids. The inlet valve 502 is connected with the filter and the inlet opening on the upper side of the pump chamber. The outlet valve 503 is connected with the parts between the pump chamber and the fluid load. The pressurizing valve 504 is connected with the parts between the input side and the output side and forms a liquid pump function with the direct drive.

The another new application equipment of this design is defined in Fig. 6. A permanent magnetic pole 601 is equipped on the upper piston 108 in Fig. 1; or a magnetic pole 630 is magnetized by the current runs through the coil 602 and is connected with the power supply using the soft conducting wire 604; or the magnetization produced by the conduction of the current using a set of carbon brush 605 and conducting rod 606. When the piston is moving, the inductive voltage is generated due to the change of magnetizing quantity between the magnetizing pole and the electric coil 607 and thus it can supply the electrical energy. Therefore, it becomes a linear drive electric generating equipment.

For the structure application, the position of the above-said permanent magnetic pole and the electric generating winding can be reserved as shown in Fig. 6-1. The magnetic field is formed by the permanent magnet 601' or the ring coil 602', in which the

movable parts are formed by the electric generating winding 607' and its electric energy is transmitted by the carbon brush 605' and the conducting rod 606' or the soft conducting wire 604'.

5 Furthermore, in the linear drive electric generating equipment, the abovementioned electric generating equipment can be equipped on the upper side of the upper piston and is moved by a rod extended from the upper piston as shown in Figure 7, in order to avoidance
10 of the electric generating volume limited by the space of the pressurizing cylinder an in order to getting better power match of the engine power and the electric generating power; or in order to keeping the pump drive function of the piston on the

pressurizing gas chamber. In Fig. 7, the upper link 701 is connected with the upper side of the upper piston 108. The gas seal cover 702 is used for the sealing of the upper gas chamber cover and the upper link 701. No. 701 is magnetizing pole; 704 is electric generating winding; 705 is magnetic circuit iron core. The selection of the structure design for the electric generation can be done as the abovementioned one, thus the magnetizing pole and the electric generating winding are equipped inversely and the electric energy is transmitted to the middle moving parts using the conducting rod and the carbon brush or the soft conducting wire. In this type of the design, the diameter and the relative dimensions can be selected for the power match in the electric generating equipment.

The abovementioned lineal drive electric generating equipment can be used for the traditional engine (See Fig. 8). Its structure character is same as the abovementioned example. The transmission rod 801 is equipped on the piston and the pierce through the cylinder cover 802. The gas seal cover 803 is used for the sealing of the lineal drive electric generating equipment coupled parts between the transmission rod 801 and the cylinder cover 802 and can move back and forth dependent on the moving of the piston, so that the electric energy can be generated.

In the various electric generation equipment of the abovementioned application examples of the electric generation, excepting the outer ring electric equipment has fixed structure and the middle electric equipment is linked with the piston, it can be done by the inverse direction, i.e. the outer ring electric equipment is dynamic acceptance

piston and moves forth and back, the middle electric equipment is atastic one and acts as the input or the output type of the electric energy for the outer cycle structure. The work is performed by the abovementioned method, i.e. by the soft conducting wires or the conducting rods or the carbon brushes.

This engine uses practically the diameters of the upper gas chamber and its upper piston and the lower gas chamber and its lower piston and can select the diameter according to the requirement in order to arrangement of the size of the pressure input gas chamber and explosion gas chamber for the used selection. For example, we can select the larger pressure input gas chamber for the lower density air in the high open air. Furthermore, as defined in the Fig. 9 & 9-1, the structure types of the separate gas chamber engine with the different cylinder diameters have the separate gas chambers with a larger and a small diameters respectively in the engine body. Its inner body has also a piston with the different diameter. This piston is connected separately with two gas chambers coupled respectively with two different diameters, in which a set one is explosion gas chamber 902 (the upper gas chamber in the diagram) and the another set is the pressure input gas chamber 901 (ring type lower gas chamber in the diagram). The piston 903 has a transverse lever link 904 for the connection of the shaking rod 955 and for the driving crank shaft 906. A ignition plug 907 or a fuel nozzole 907' and a single way intake door 908 connected with the pressure reservoir are equipped in the near of the upper stop point of the

combustion gas chamber. A exhaust opening 909 is equipped in the near of the lower stop of the explosion gas chamber 902. A single way intake door 910 and a single way exhaust opening 911 connected with the pressure reservoir 912 are equipped in the near of the upper stop point gas chamber. After the engine has started, the combustion gases with the high pressure are stored in the pressure reservoir 912 for each work cycle due to the pressure input volume is larger than the explosion gas chamber. During the intake travel, the intake door is opened and the fresh airs come into the combustion chamber.

As to the lubrication, the lubricating oil can be distributed by the pump leaf blade equipped on the crank shaft to inside of the piston and then penetrated to the friction surfaces.

If we use one unit type of the drive pump in the separate gas chamber with the different diameters, its structure character is same as which shown in Fig. 10 & 10-1, i.e. it is a two travel engine with the direct coupling and independent pump structure. The engine housing 1001 has gas chambers with a large and a small diameters respectively, in which the upper gas chamber is two travel standard pressure input explosion gas chamber 1002 and the lower ring gas chamber with the larger diameter is pump chamber 1003 used for the fluid pump. In the near of the upper stop point, a inlet of a single way valve 1004 and a outlet of the another single way valve 1005 are equipped. They can generate the gas pump function in the engine drive. Because this engine has a larger volume of the lower piston, the pressure generated by

equipment.

5 The above-said linear drive electric generating
equipment and the above-said direct drive fluid pump
can be used for the traditional engine (See Fig. 8).
Its structure feature is same as the above-said example.
The transmission rod 801 is equipped on the piston and
the pierce through the cylinder cover 802. The gas
seal cover 803 is used for the sealing of the linear
10 drive electric generating equipment coupled parts
between the transmission rod 801 and the cylinder
cover 802 and can move back and forth dependent on
the moving of the piston, so that the electric energy
can be generated; or as shown in Fig. 8-1, the upper
15 piston 804 driven back and forth by the transmission
rod 801; the cylinder set 805 coupled with the piston
is installed in the upper side of the engine and the
single way input valve 806 and single way output
valve 807 which generate the pump motive effect are
20 installed in the upper side or lower side of the
cylinder set 805; or furthermore as shown in Fig. 8-2,
the upper side of the cylinder set 805 is shown the
seal situation and the piston 804 is shown two ways
pump motion and the two ends of the gas chamber of the
upper gas cylinder set install single way input valves
25 806 and 806' which connected each other in parallel,
and the single way output valves 807 and 807' to
generate the two ways pump motion driven forth and
back by the piston 804; The further feature of this
30 two ways pump motion structure is shown in Fig. 8-3,

the upper and lower input and output valves are connected respectively to the pump motive fluids to form two independent pump system which don't transmit each other.

5 In the various electric generation equipment of the above-said application example of the electric generation, excepting the outer ring electric equipment has fixed structure and the middle electric equipment is lined with the piston, it can be done by the
10 inverse direction, i.e. the outer ring electric equipment is dynamic acceptance piston and moves forth and back, the middle electric equipment is static one and acts as the input or the output type of the electric energy for the outer cycle structure. The
15 work is performed by the above-said method, i.e. by the soft conducting wires or the conducting rods or the carbon brushes.

20 This engine uses practically the diameters of the upper gas chamber and its upper piston and the lower gas chamber and its lower piston and can select the diameter according to the requirement in order to arrangement of the size of the pressure input gas chamber and explosion gas chamber for the
25 used selection. For example, we can select the larger pressure input gas chamber for the lower density air in the high open air. Furthermore, as defined in the Fig. 9 and 9-1, the structure types of the separate gas chamber engine with the different cylinder
30 diameters have the separate gas chambers with a larger

and a small diameters respectively in the engine body.

Its inner body has also a piston with the different diameter. This piston is connected separately with two gas chambers coupled respectively with two different diameters, in which one set is explosion gas chamber 902 (the upper gas chamber and having smaller volume of gas chamber in the diagram) and the another set is the pressure input gas chamber 901 (the ring type lower gas chamber and having larger volume of gas chamber in the diagram). The piston 903 has a transverse lever link 904 for the connection of the shaking rod 955 and for the driving crank shaft 906. A ignition plug 907 or a fuel nozzle 907' and a single way intake door 908 connected with the pressure reservoir are equipped in the near of the upper stop point of the combustion gas chamber. A exhaust opening 909 is equipped in the near of the lower stop point of the explosion gas chamber 902. A single way intake door 910 and a single way exhaust opening 911 connected with the pressure reservoir 912 are equipped in the near of the upper stop point gas chamber. After the engine has started, the combustion gases with the high pressure are stored in the pressure reservoir 912 for each work cycle due to the pressure input volume is larger than the explosion gas chamber. During the intake travel, the intake door is opened and the fresh airs come into the combustion chamber.

As to the lubrication, the lubricating oil can be distributed by the pump leaf blade equipped on the

crank shaft to inside of the piston and then penetrated to the friction surfaces.

If we use one unit type of the drive pump in the separate gas chamber with the different diameters, its structure feature is same as which shown in Fig. 10 and 10-1, i.e. it is a two travel engine with the direct coupling and independent pump structure. The engine housing 1001 has gas chamber with a larger and a small diameters respectively, in which the upper gas chamber is two travel standard pressure input explosion gas chamber 1002 and the lower ring gas chamber with the larger diameter is pump chamber 1003 used for the fluid pump. In the near of the upper stop point, an inlet of a single way valve 1004 and an outlet of the another single way valve 1005 are equipped. They can generate the gas pump function in the engine drive. Because the engine has a larger volume of the lower piston, the pressure generated by the crank shaft case used for the intake pump of the two travel engine during the running travel is larger than the traditional one and is more advantage for the intake.

Fig. 11 and 11-1 show the application example of the equipment in the four travel engine. Its structure feature is same as which shown in the two travel one.

When the above-said one unit type of the intake pressurizing, separate gas chamber structure and the industrial equipment is used for Diesel engine, the

structure and the principle are same as the above-said one with the exception of the change of the ignition plug to jet oil nozzle and the increament of the compression ratio.

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In a word, this case is a improved application structure, please give us an approval.

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C L A I M S:

1. A reciprocating internal combustion engine comprising a cylinder body including at least one power piston/cylinder combination and at least one auxiliary piston/cylinder combination with the said combinations disposed in coaxial relationship, a separating wall disposed between adjacent piston/cylinder combinations, a connection rod coaxially interconnecting the pistons for synchronous movement thereof between top- and bottom-dead-centre positions of the pistons and sealingly passing through said separating wall or walls, a connecting rod and crank-shaft for converting reciprocal motion of the said combination into a rotational output, an exhaust port for discharging exhaust gases from the power cylinder when the power piston is in the region of bottom-dead-centre, an inlet port including a one-way in valve in communication with at least that auxiliary cylinder adjacent the power cylinder, means for controlling operation of the said one-way valve in accordance with the engine firing cycle, a gas transport passage interconnecting a power cylinder and an adjacent auxiliary cylinder, and a valve for controlling transportation of gas through the passage, a gas pump chamber disposed on at least that side of an auxiliary piston remote from an adjacent power piston for compressing gaseous media, and means for igniting a fuel/gas mixture in each power cylinder or injecting fuel into each power cylinder.
2. An engine according to Claim 1 including two auxiliary piston/cylinder combinations wherein those chambers disposed on each side of each auxiliary piston are intake chambers and each chamber includes a one-way inlet and a one-way inlet and a one-way exhaust valve,

- 2 -

wherein the two intake valves are connected with a carburettor and each exhaust valve is connected with a pressure reservoir, and wherein the pressure reservoir receives compressed combustion gases pumped by displacement of one piston and serves to feed such gases into the combustion chamber of a power piston/cylinder combustion.

3. An engine according to any preceding claim wherein compressed gas from the auxiliary piston/cylinder combinations is directed to a fluid pump.

4. An engine according to Claim 1 or Claim 2 wherein compressed gases from the auxiliary piston/cylinder combinations are fed to a turbine for super charging intake of a power piston/cylinder combination via a carburettor.

5. An engine according to Claim 1 including a third auxiliary piston/cylinder combination and a pressure reservoir for receiving gas under pressure from each auxiliary piston/cylinder combination.

6. An engine according to any preceding claim including electrical energy generating equipment comprising a permanent magnetic or an electro-magnetizable coil support by an auxiliary piston, and a power supply for the coil whereby displacement of the piston generates a voltage by the change of the magnetizing quantity between the magnetized pole and the electric generating coil and take-off means for the so generated electric energy.

7. An engine according to Claim 6 modified in that the said electric energy generating equipment is associated with a rod constituting an extension from an auxiliary piston.

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8. An engine according to Claim 3,4 or 5 wherein the coaxial connecting rod is sealed with an oil seal, wherein the said inlet port is closable during upward and downward motion with the power piston and wherein those chambers formed on each side of an adjacent auxiliary piston includes a single way input valve and single way output valve connected to each other in parallel for the generation of the pump function in the two ways drive.

9. An engine according to Claim 8 wherein each auxiliary piston/cylinder combination includes inlet/outlet one-way valves whereby chambers disposed on each side of the pistons are independently operable as pumps.

10. An engine according to any preceding claim wherein at least one piston/cylinder combination is of different diameter when compared with at least one other combination.

11. An engine according to Claim 1 wherein the cylinder body has the separate gas chamber with a large and a small diameter respectively and its inside has a piston with the different diameter coupled separately with two sets of the gas chambers with the different diameters, in which a set is the pressure input gas chamber and another set is the explosion gas chamber, the piston has a transverse link rod for the linking of the shaking rod and make the crank shaft a motion, an ignition plug or fuel nozzle and a single way intake door connected with the pressure reservoir is equipped in the near of the upper stop point in the combustion gas chamber, exhaust opening is located in the lower stop point, a single way intake door and single way exhaust opening connected to the pressure reservoir are equipped in the near of the upper stop point in the pressure input gas chamber whereby, when the volume of the pressure input gas chamber is larger than which in the explosion gas chamber, the high pressure fresh combustion gas is stored in the pressure reservoir during

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each work cycle and when the intake is open fresh combustion gas enters the combustion chamber during the intake travel.

12. An engine according to Claim 10 wherein the cylinder body includes a gas chamber with a large volume and a gas chamber of smaller volume in which an upper gas chamber has the smaller volume and is two-travel input explosion gas chamber and the gas chamber with the larger diameter is operable as a fluid pump, an inlet with a single way valve and an outlet with a single way valve located in the region of top-dead-centre of the generation of the gas pump function.

1/27

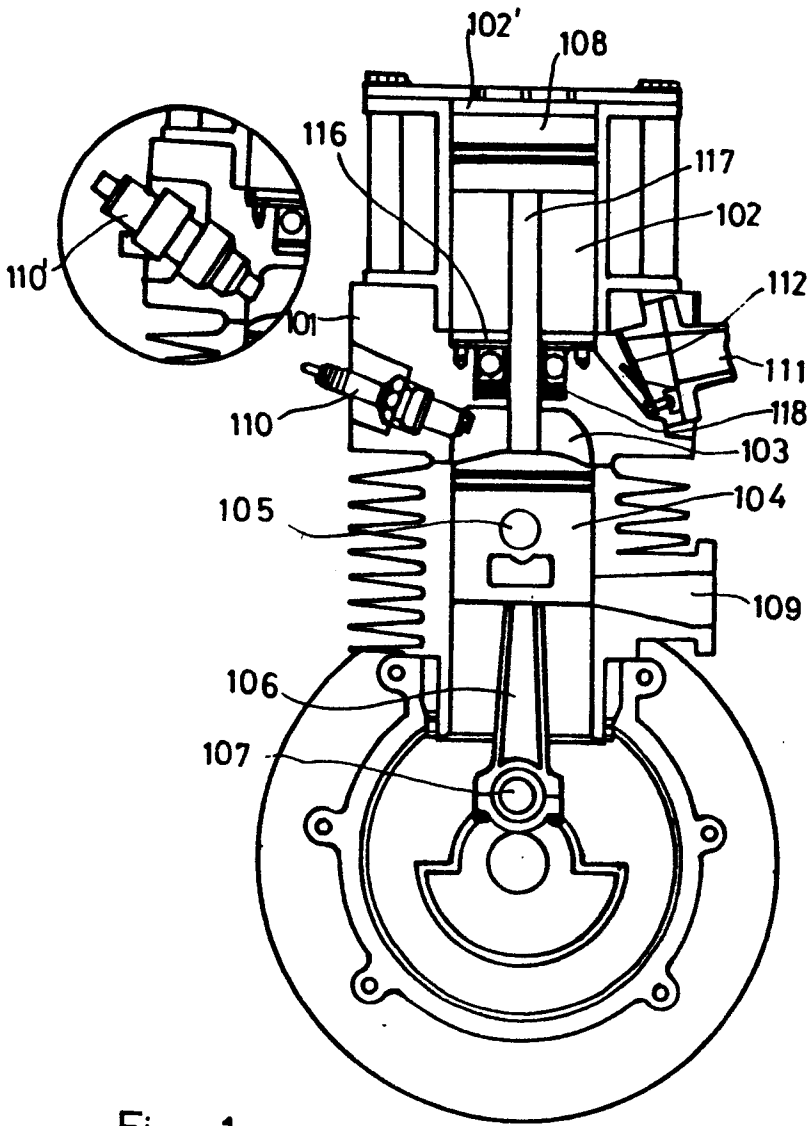
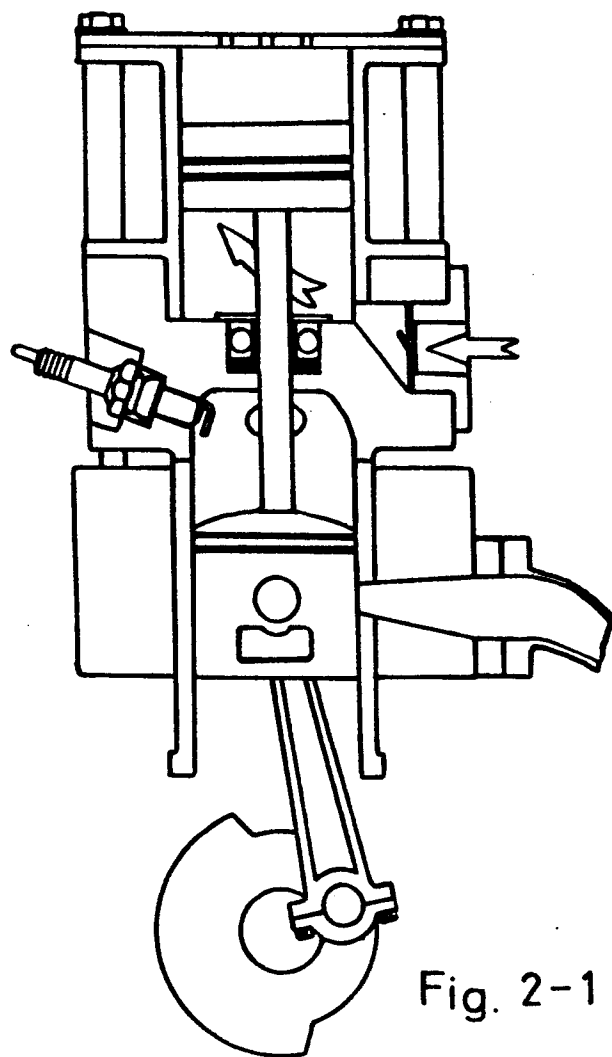


Fig. 1

$\frac{3}{27}$ 

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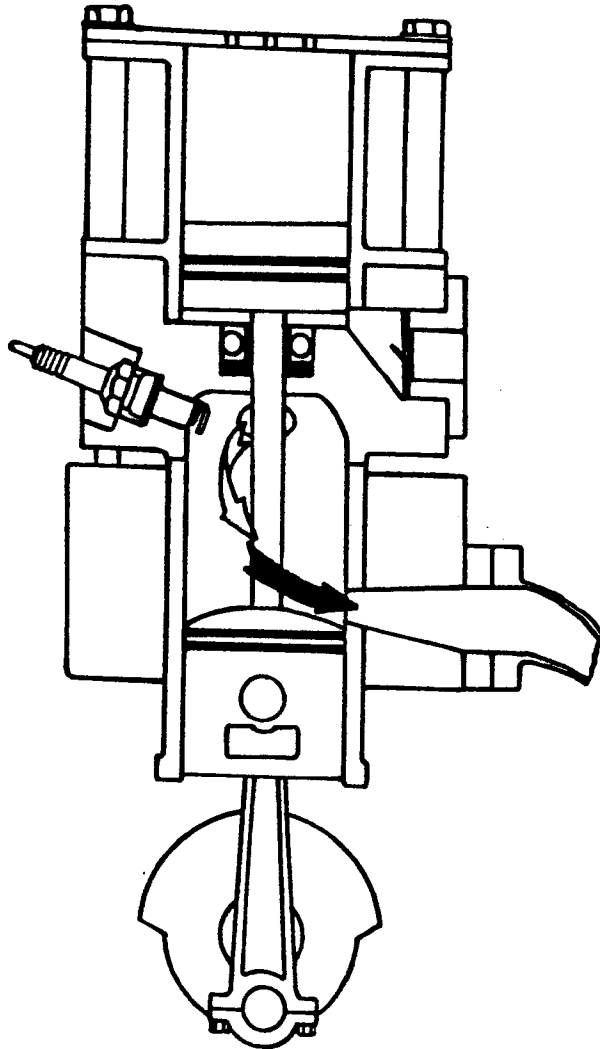


Fig. 2-2

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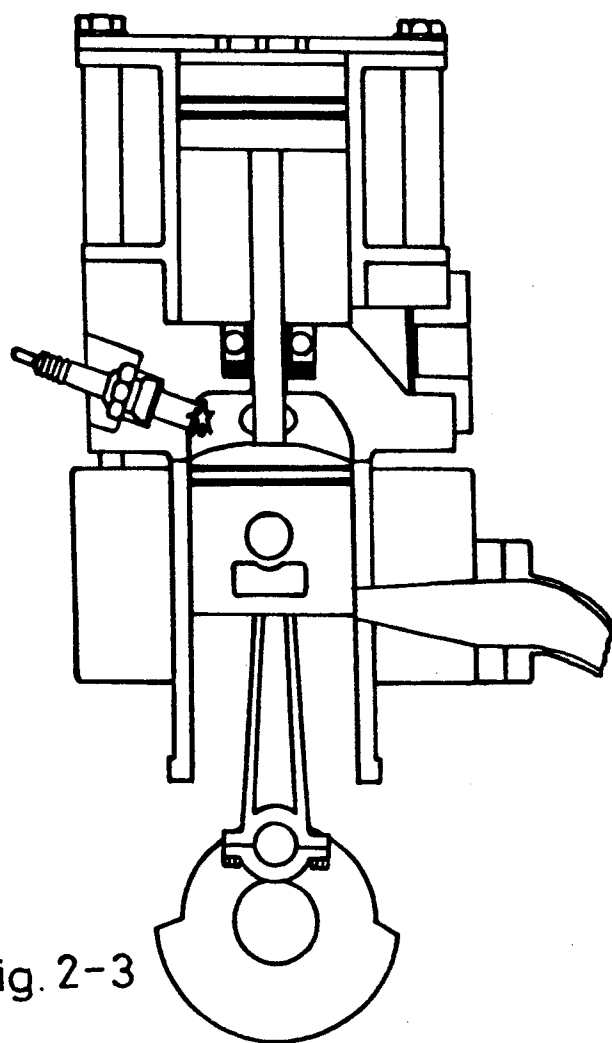


Fig. 2-3

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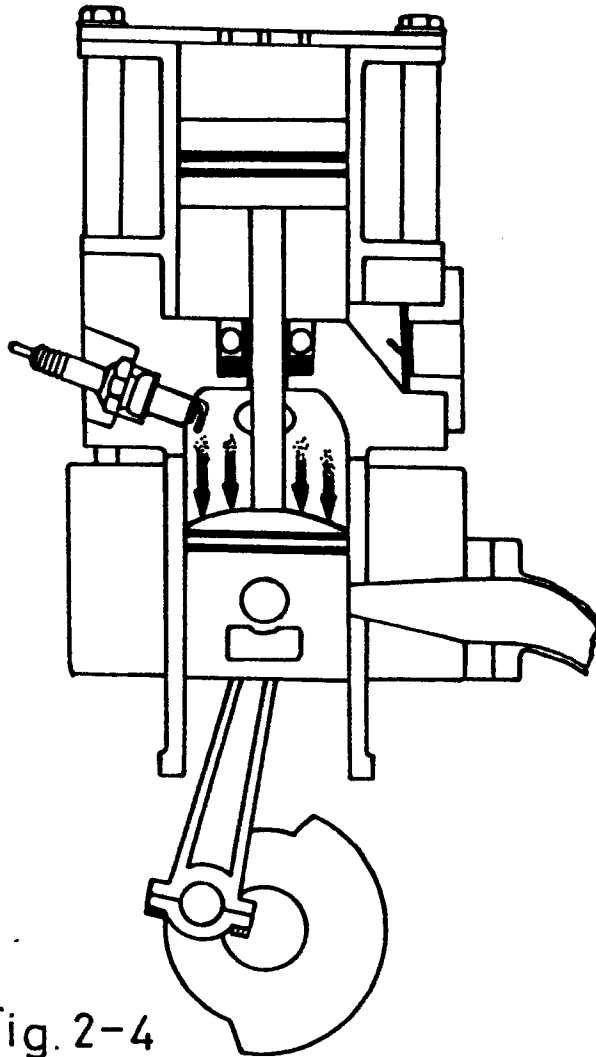


Fig. 2-4

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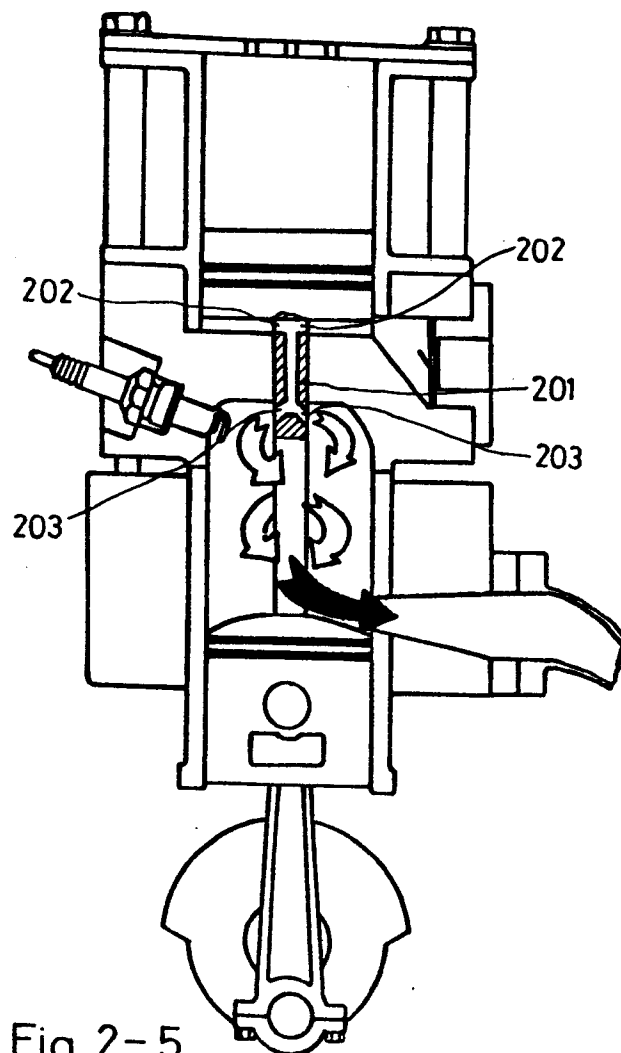


Fig. 2-5

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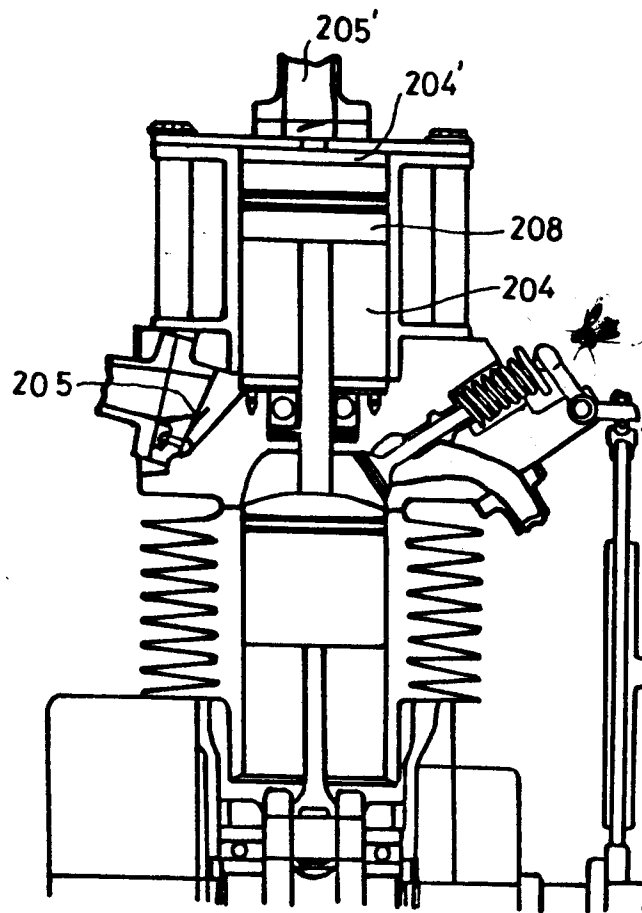


Fig. 2-6

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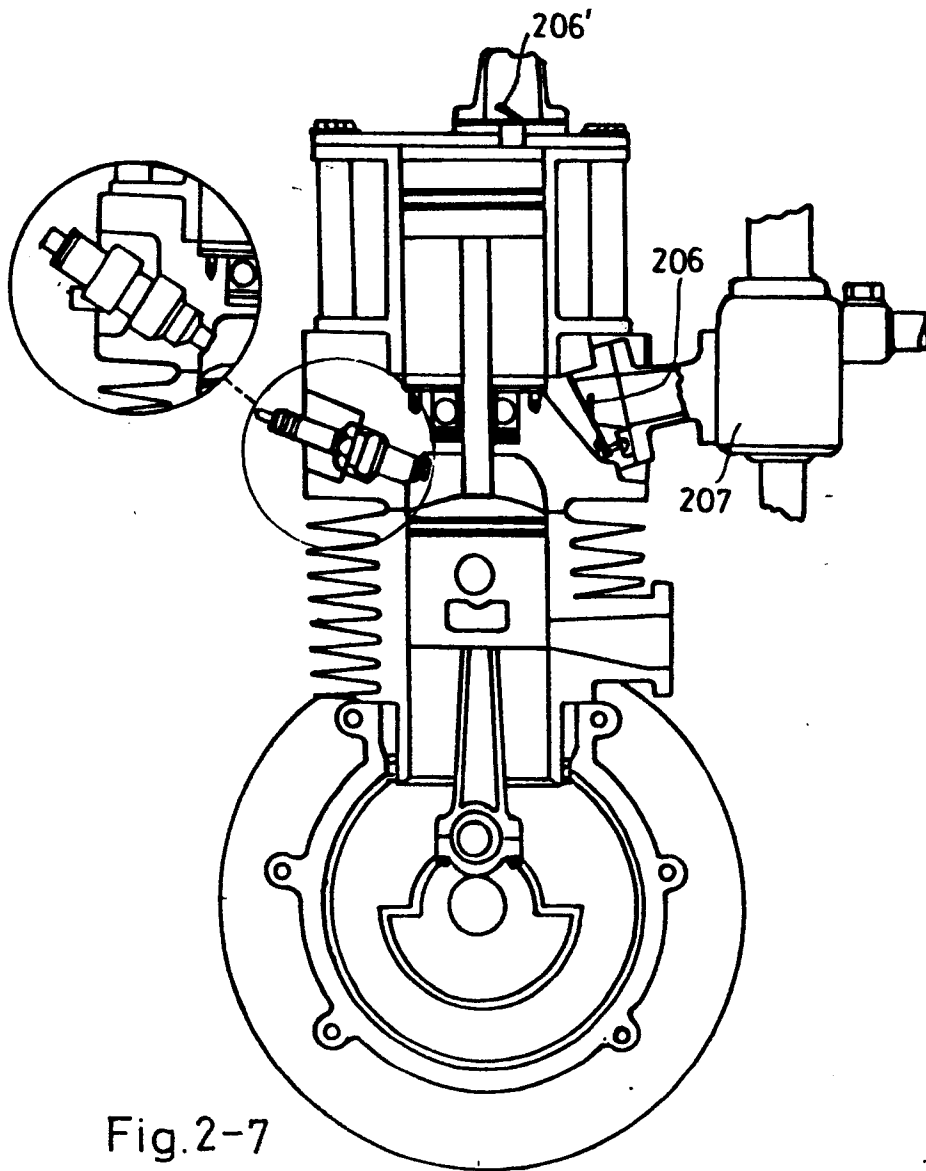
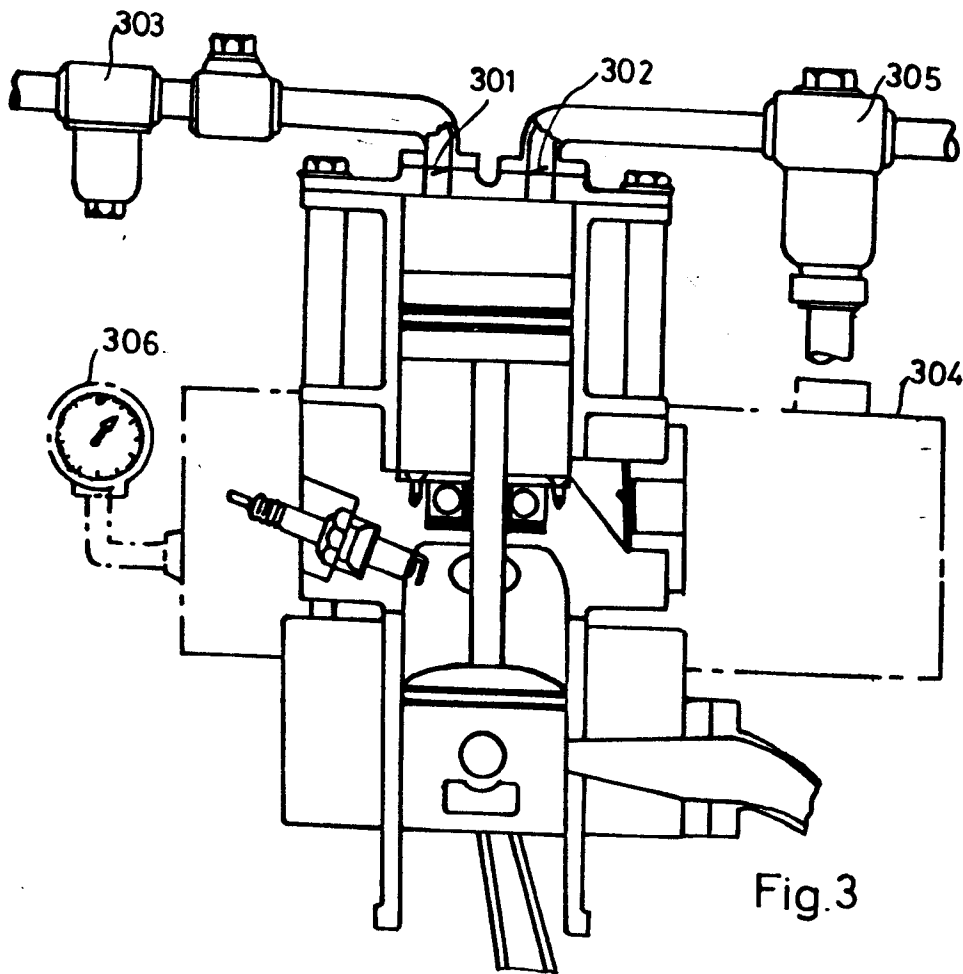


Fig.2-7

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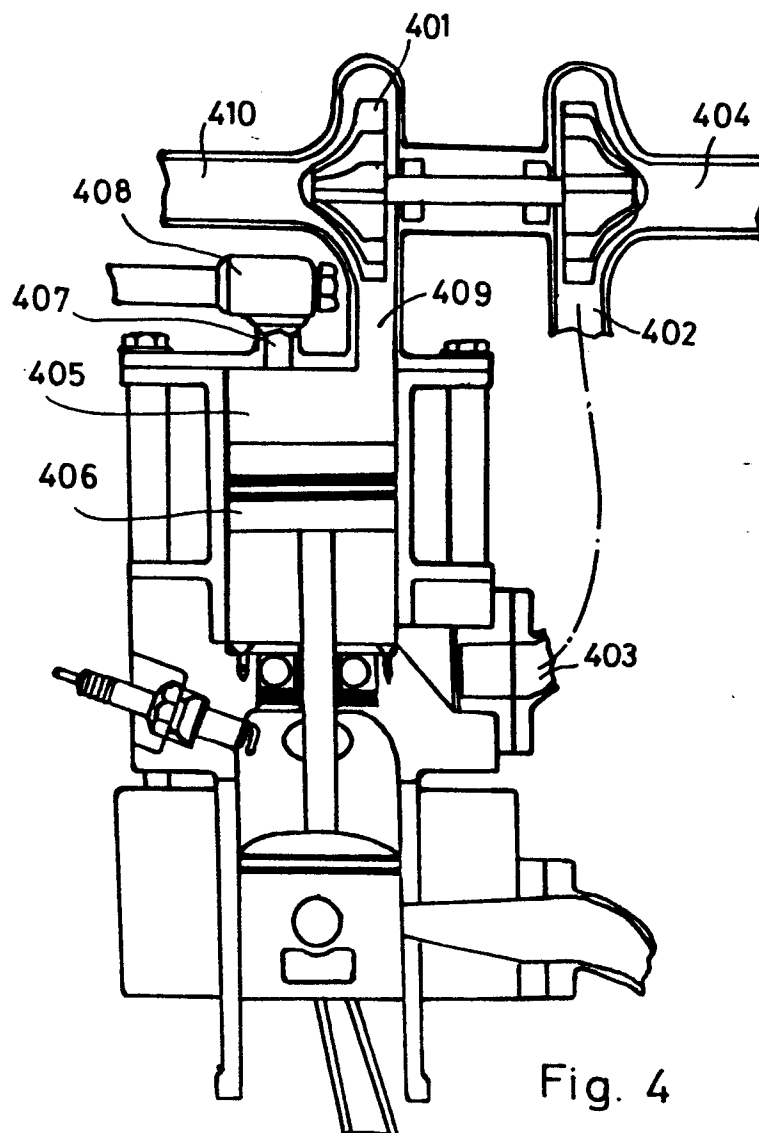


Fig. 4

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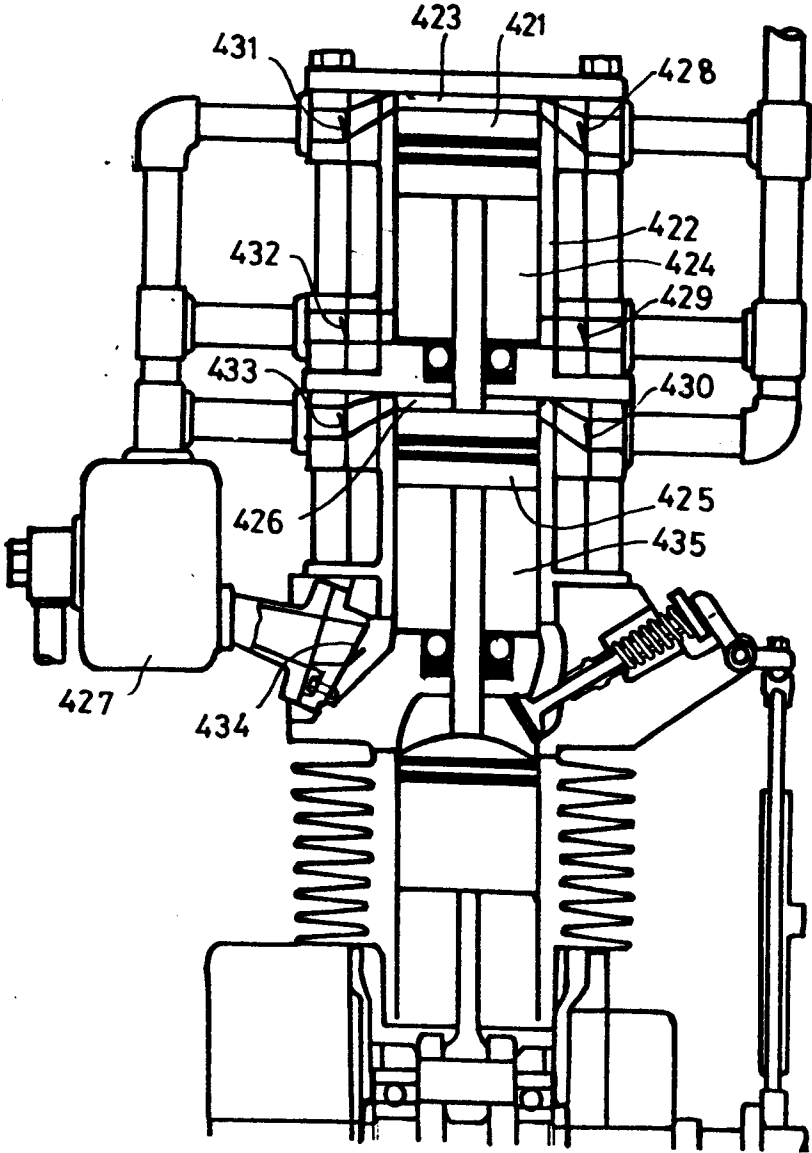


Fig. 4-1

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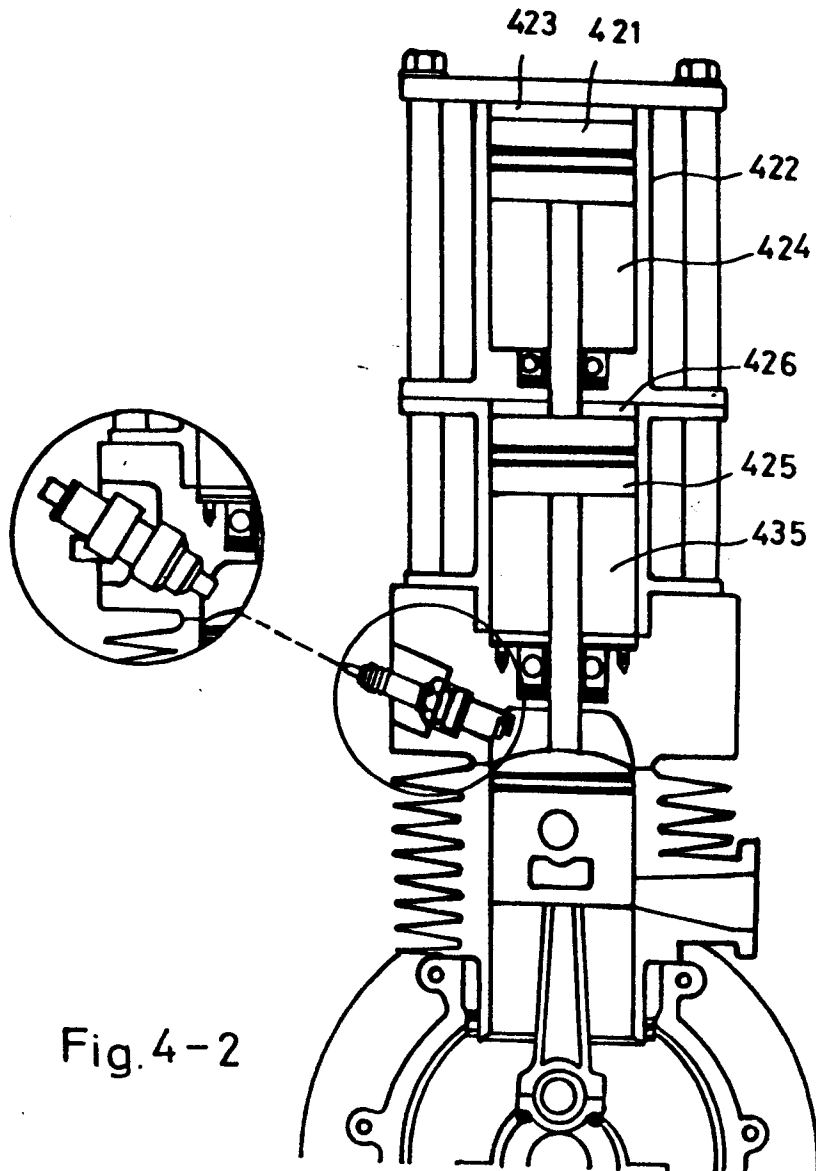
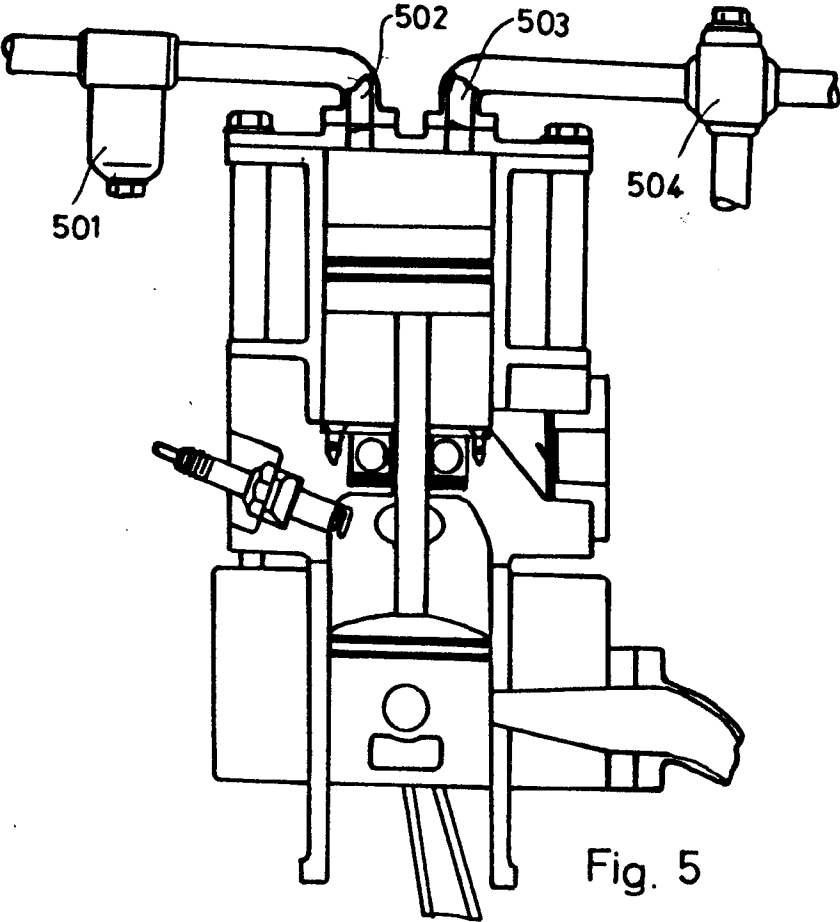


Fig. 4-2

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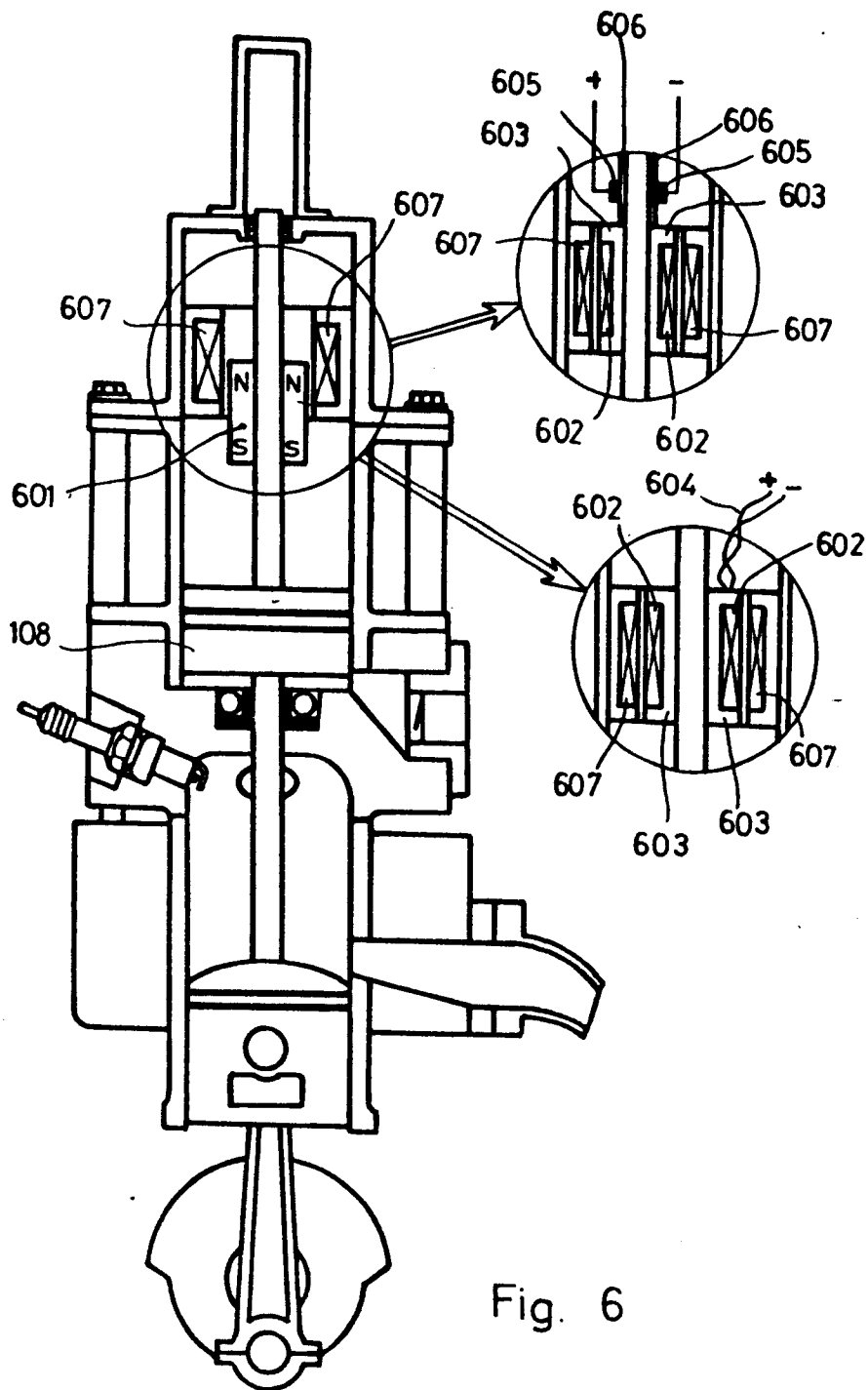


Fig. 6

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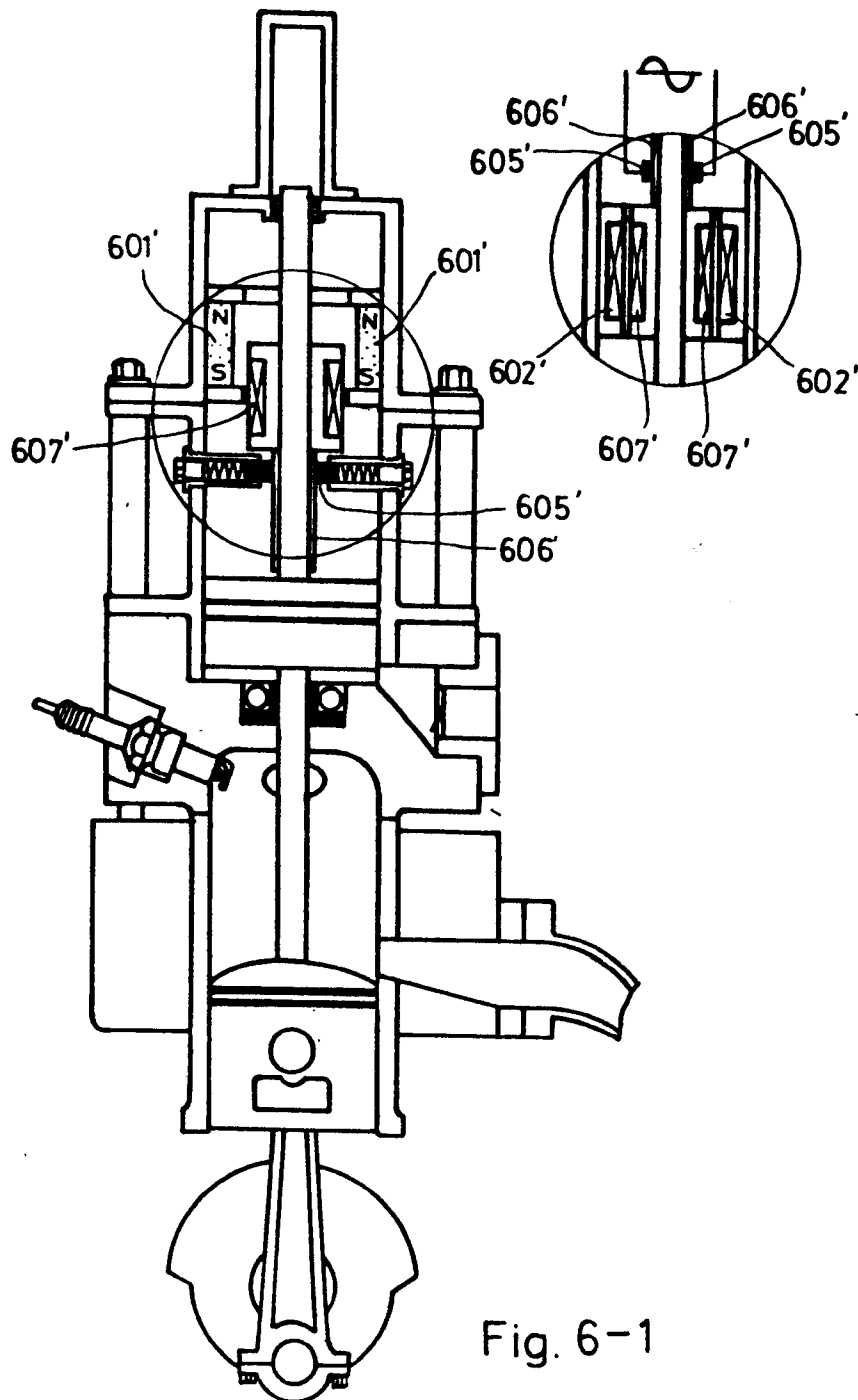


Fig. 6-1

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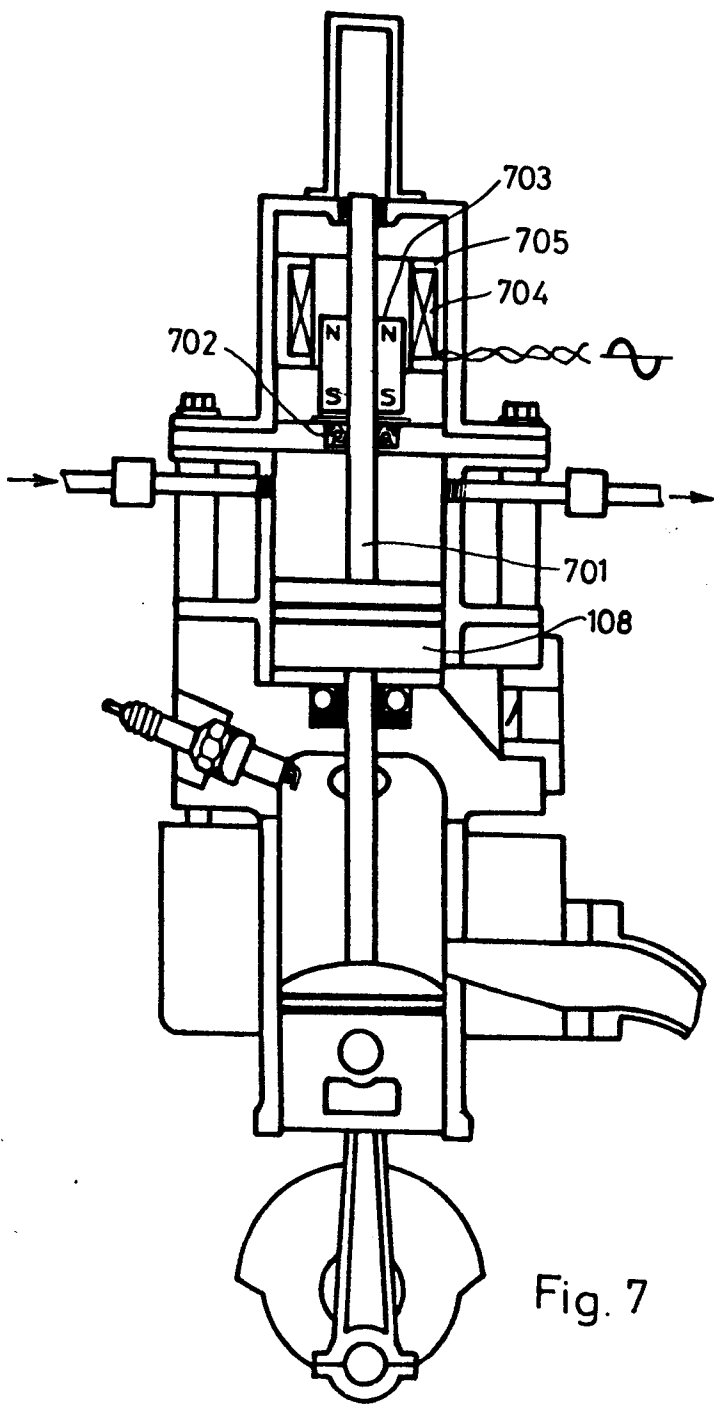


Fig. 7

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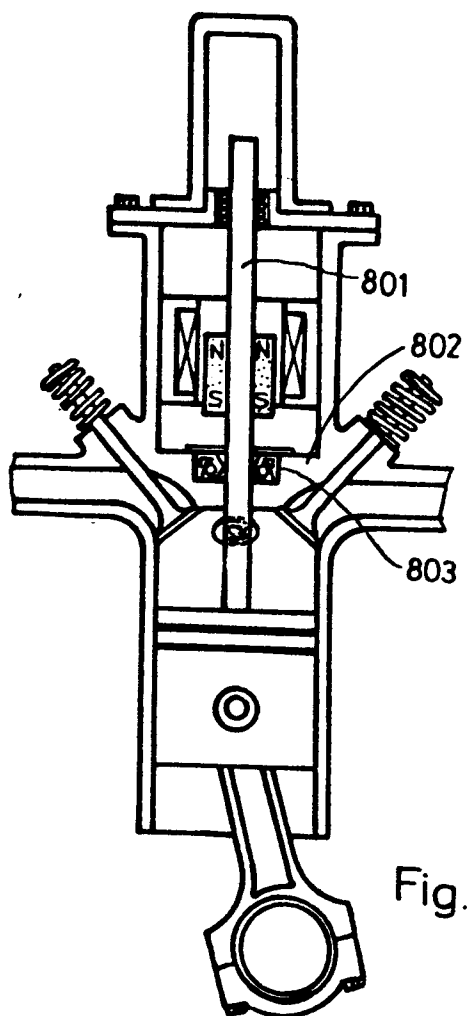
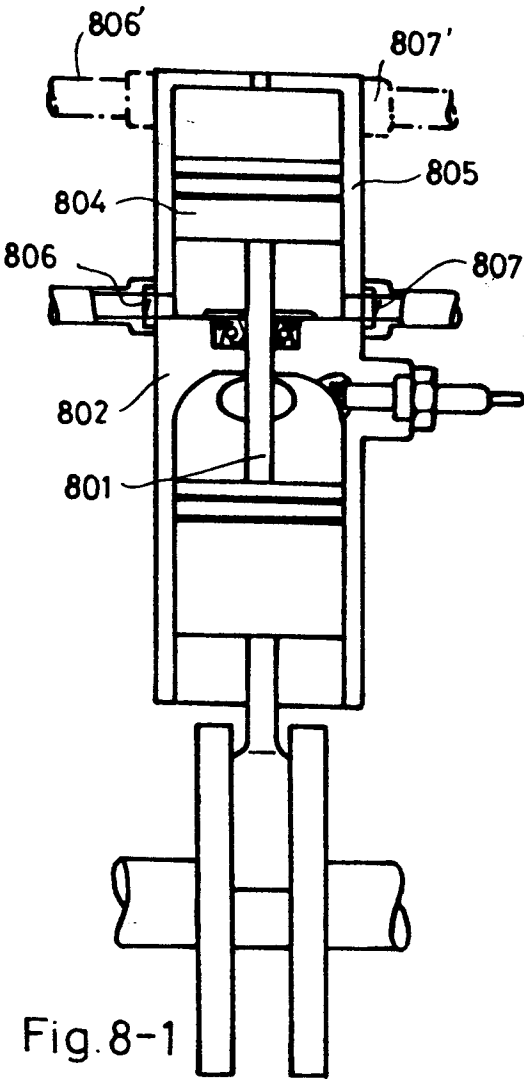
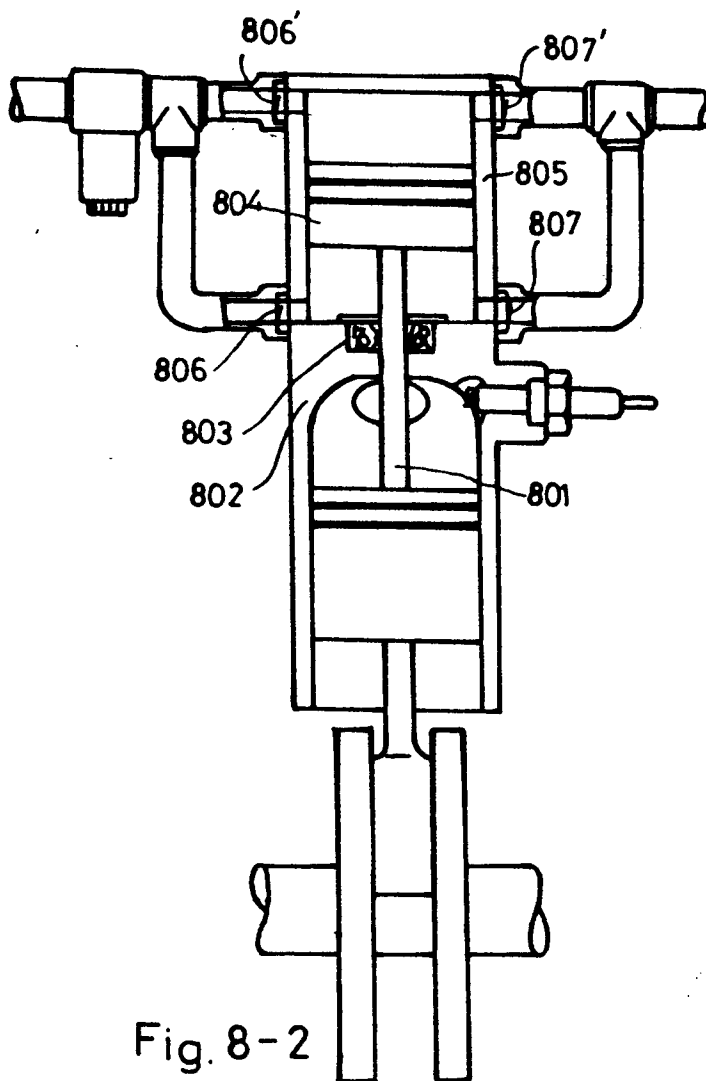


Fig. 8

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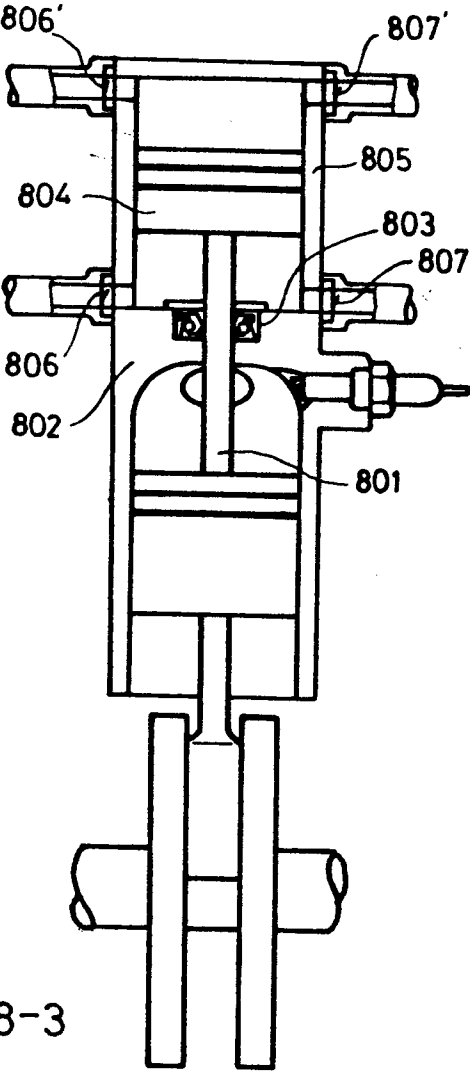


Fig. 8-3

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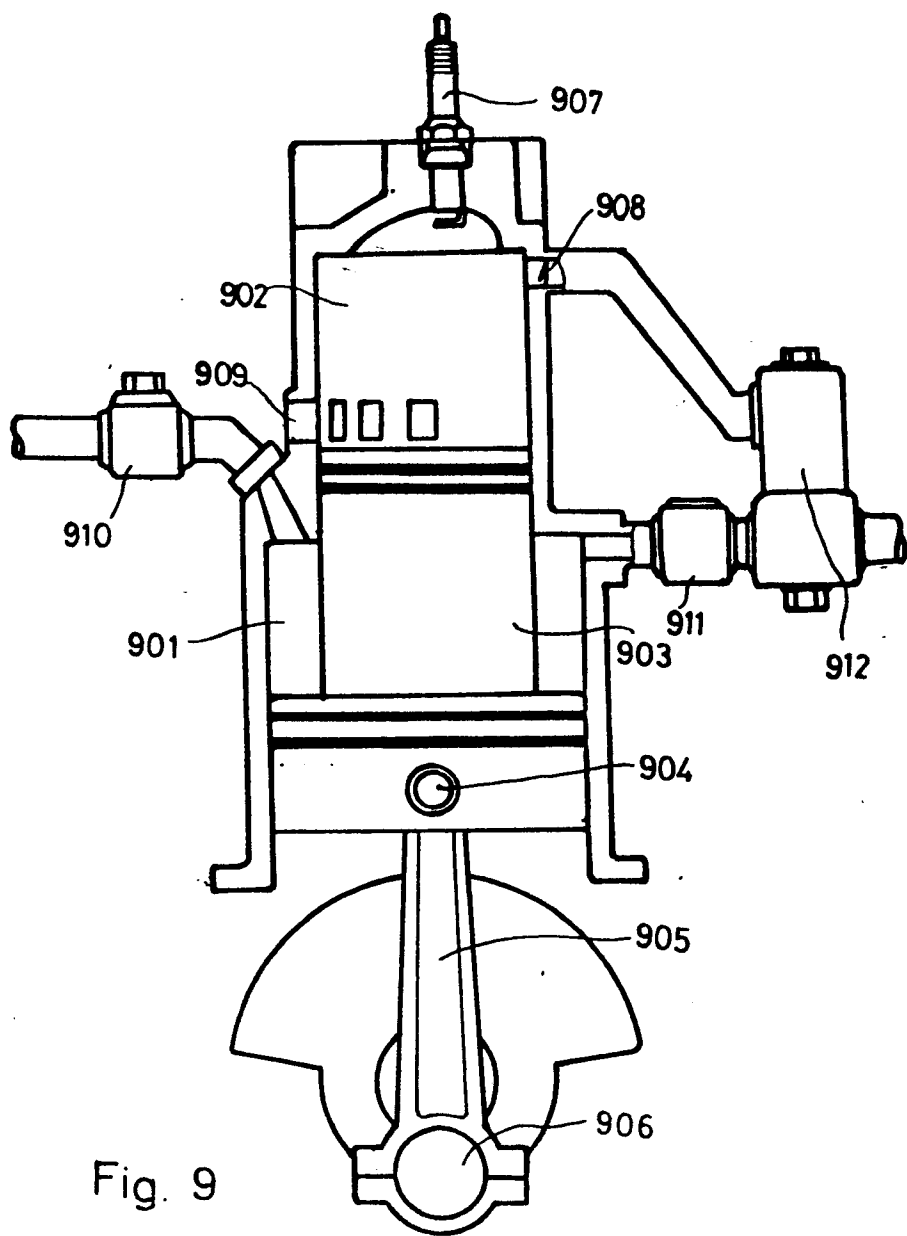


Fig. 9

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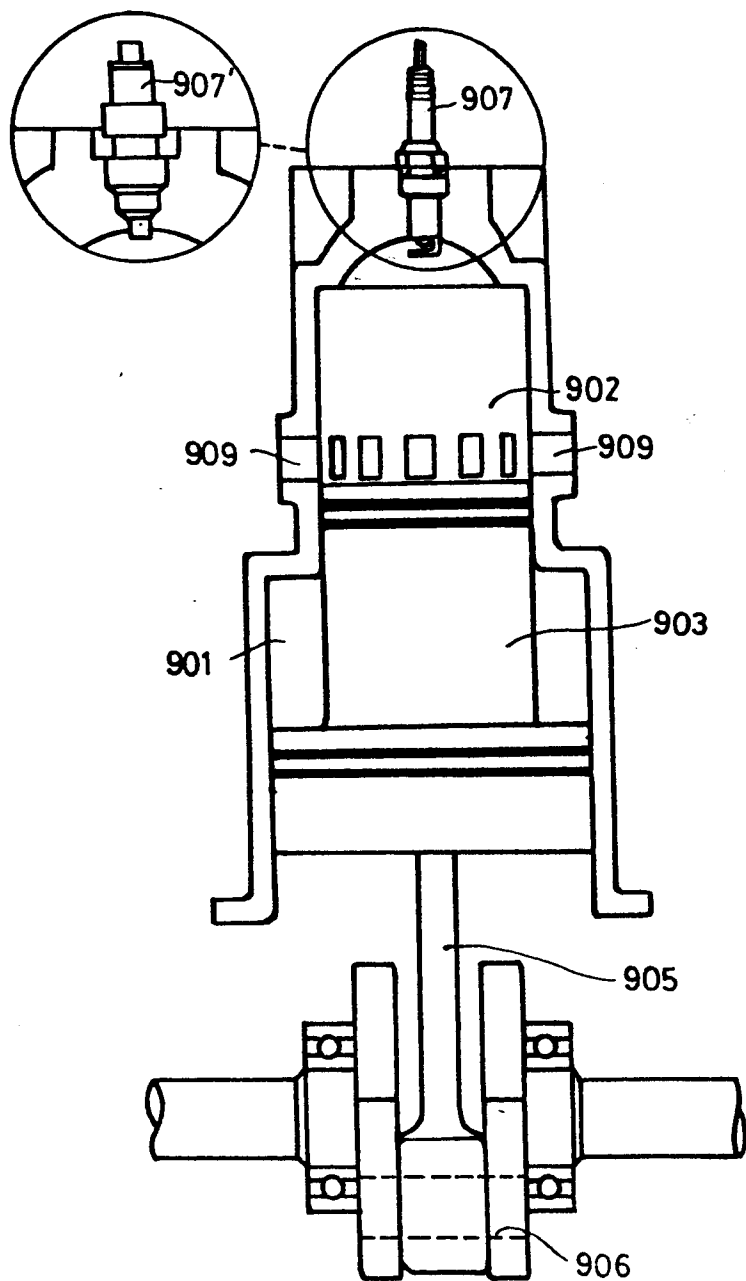


Fig. 9-1

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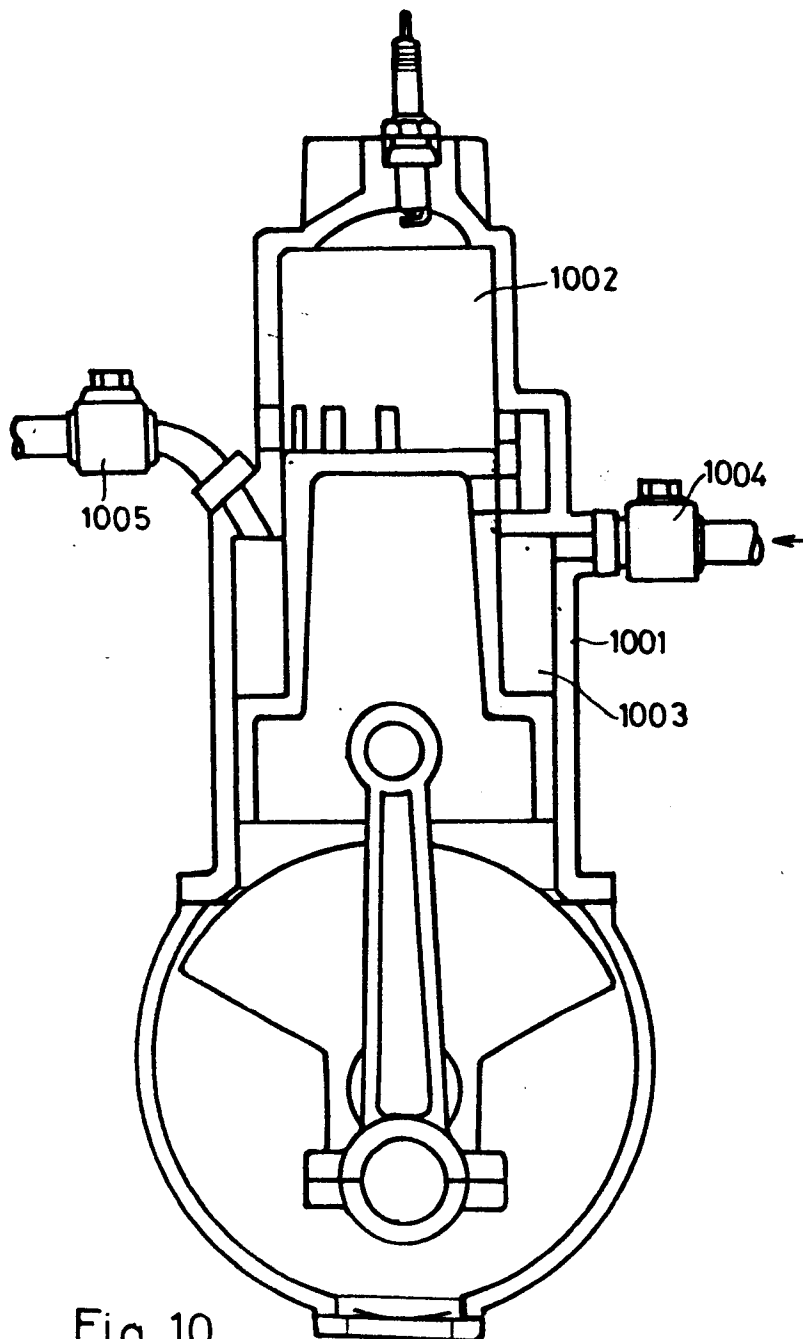


Fig. 10

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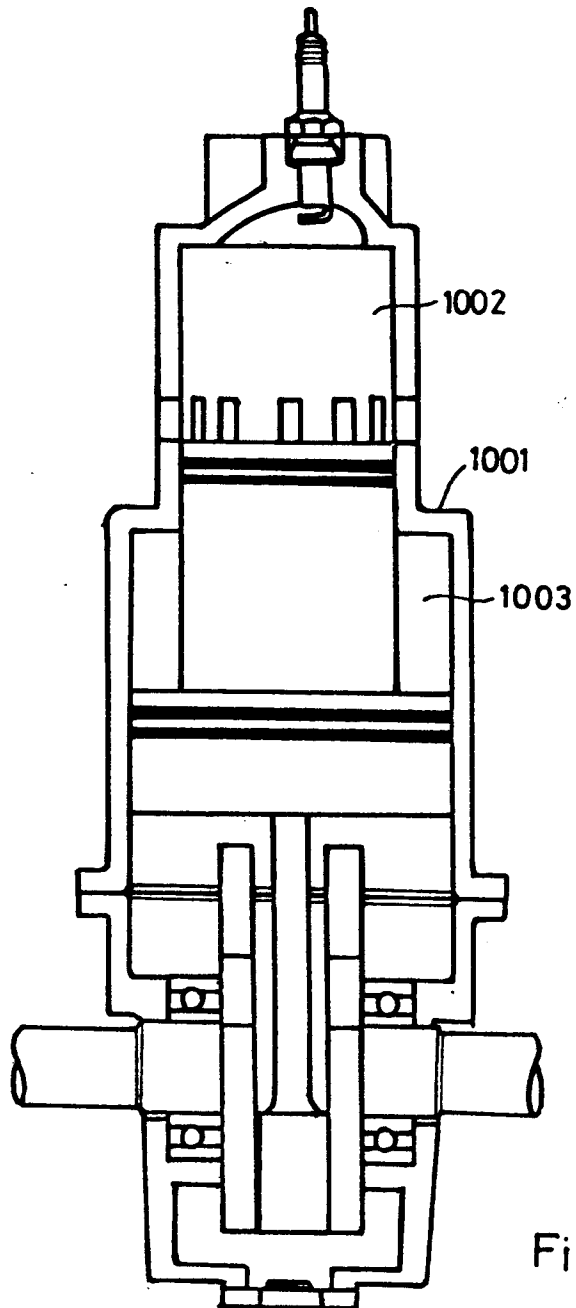


Fig.10-1

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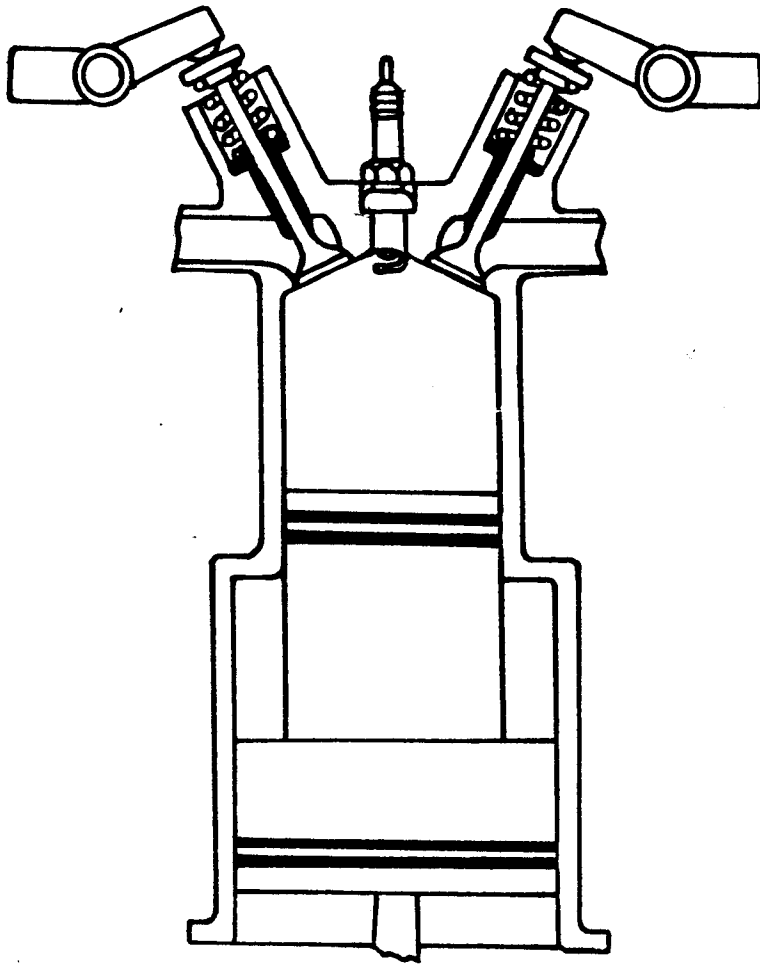


Fig. 11

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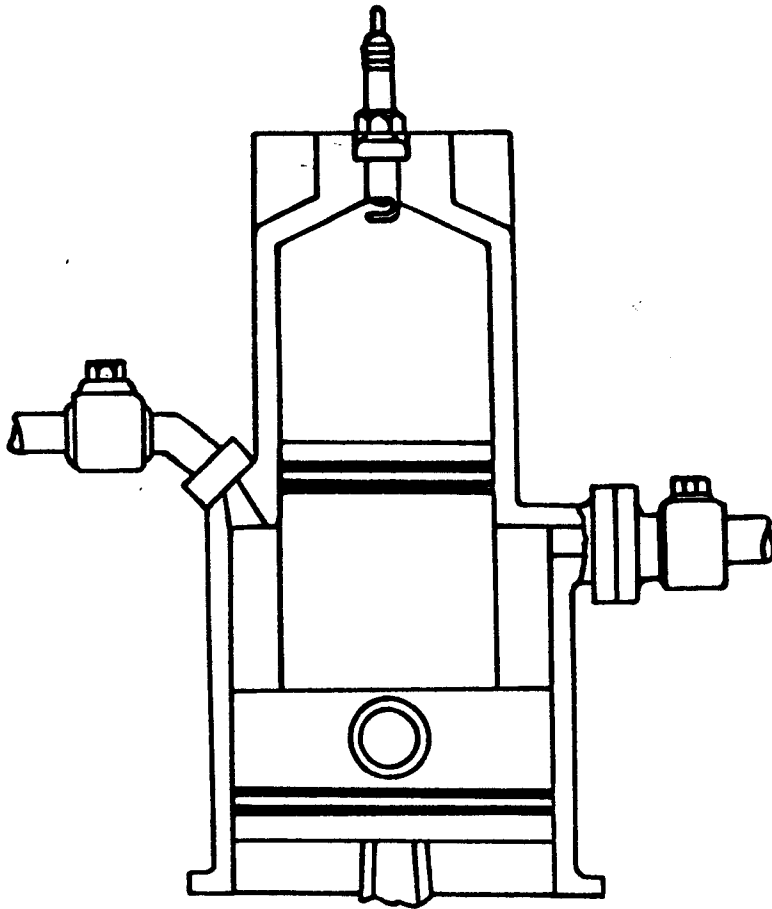


Fig. 11-1

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EUROPEAN SEARCH REPORT

Application number

EP 86 30 8255

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	DE-A-2 901 815 (WAKER) * Page 3, line 5 - page 4, line 29; figure *	1, 2, 8-12	F 02 B 33/08 F 02 B 33/14 F 02 B 63/04
Y	---	3, 4, 6, 7	
Y	GB-A-1 137 087 (M.A.N.) * Page 3, lines 43-75; figure 5 *	3	
Y	DE-B-1 214 474 (M.A.N.) * Column 3, lines 34-43; figure 1 *	4	
Y	GB-A- 820 311 (ANDERBERG) * Page 1, line 65 - page 3, line 19; figure *	6, 7	TECHNICAL FIELDS SEARCHED (Int. Cl.4) F 02 B
A	---	1, 10-12	
X	DE-A-1 526 366 (WAGNER) * Page 9, line 3 - page 15, line 7; figures 2, 3 *	1, 2, 5, 8	
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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 29-01-1987	Examiner HAKHVERDI M.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EUROPEAN SEARCH REPORT

Application number

EP 86 30 8255

DOCUMENTS CONSIDERED TO BE RELEVANT			Page 2
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	DE-C- 504 514 (PLAGE) * Page 1, line 29 - page 2, line 69; figure 1 *	1	
X	GB-A- 396 369 (LINDEQUIST) * Page 4, lines 4-18; figure 4 *	1,2,5,8	
X	DE-C- 223 985 (GUICHARD) * Page 1, lines 29-70; figure 1 *	1,2,8,9	
X	GB-A- 193 651 (SIDNEY) * Page 3, lines 7-70; figures 1,2 *	1,10-12	
A		2,8,9	TECHNICAL FIELDS SEARCHED (Int. Cl.4)
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 29-01-1987	Examiner HAKHVERDI M.
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