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(54) **TWO-STROKE ENGINE WITH SPARK IGNITION**

FREMDGEZÜNDETE ZWEITAKTBRENNKRAFTMASCHINE

MOTEUR DEUX TEMPS A ALLUMAGE PAR ETINCELLE

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EP 0 776 423 B1

Description

Field of the invention

The subject matter of this invention is the two-stroke multi-cylinder engine with spark ignition, in which the energy of exhaust gases produced during the engine operation is used to prepare the combustible charge.

Background of the invention

The main reason for the limited application of two-stroke engines, especially to mechanical vehicles, is toxicity of the exhaust gases they release. One of the design trends which improve operation of the two stroke engine consists in eliminating the outlet losses by supplying fuel to the cylinder space after the exhaust port has been closed, and controlling combustion by spacial qualitative differentiation of the fuel charge, which consists, among other things, in producing an enriched mixture in the spark plug zone. A method of producing such a laminar structure of the mixture is known, in which a gaseous charge containing fuel is introduced from a separate feed chamber to the air, or to a lean combustible mixture compressed by the piston in the cylinder space. The charge containing fuel consists of vaporized liquid fuel mixed with air or with exhaust gases; it is very rich in fuel, beyond the flammability limit. The fuel charge jet is introduced during the compression stroke through the feed canal leading from the feed chamber where the fuel charge is compressed to a pressure higher than that in the cylinder space at the moment of delivering the fuel charge. The feed canal is oriented towards the spark plug. Mutual mixing of the two charges results in the desired differentiation of the mixture, as regards its combustibility properties, in the engine cylinder space.

There are many engine designs in which the fuel charge is prepared in this manner. In the engine presented in the specification of the German patent No. DE 2 241 643 a piston compressor driven by a gear from the crankshaft plays the role of the feed chamber. The compressor cylinder space is connected, via a suction canal, with a device spraying fuel into the drawn-in air, and with the engine cylinder space via a feed canal in which a non-return valve is mounted. The feed canal, positioned in the compressor cylinder wall, is uncovered when it meets the orifice in the piston projection at the moment the compressed charge containing fuel should be introduced to the engine cylinder space.

In an other engine, described in the specification WO 91/02144, the fuel is delivered into the cylinder space in the stream of pressurized air flowing from the feed chamber. Two solutions are presented. In the first one the feed chamber is connected with the cylinder space via feed canal and with the crankcase via exhaust gas charging canal. In the second one the two mentioned canals are leading to the cylinder wall. In these engines the feed chamber constitutes a pressurized air accumulator. It is supplied by means of exhaust gas charging canal from the crankcase during the power stroke in the first example, and from the cylinder space during the pressure stroke in the second example. The fuel is introduced to the feed canal by means of opened nozzle of the spraying device.

In the second solution the feed canal is leading to the cylinder wall through the opening situated directly above the upper edge of the exhaust port and exhaust gas charging canal closely below the piston top at the moment of ignition.

The inner space of rotary element constitutes the feed chamber. The cylindrical control element is driven by non-slip transmission from the crankshaft. In the wall of the control element the opening is disposed which meets, during the pressure stroke, alternatively, the exhaust gas charging canal and the feed canal at the moments directly before the closing of the openings of these canals by the upper edge of the piston.

In multi-cylinder unit the common air feed chamber is provided and the fuel is introduced separately to each feed canal.

Among the designs which use the energy of pressure and temperature of the exhaust gas to prepare the fuel charge, is the engine presented in the German journal VDI Bericht, appendix No. 1066 entitled "Direkte Gemischeinblasung an 2-Takt-Ottomotoren", which describes the oral presentation by G.K.Fraidl, R.Knoll, and H.P. Hazeu at a conference held in Dresden on 3-4 June 1993. In the engine head, a feed chamber is made which is connected with the cylinder space by means of a feed canal with an electromagnetically operated cut-off valve. A spray nozzle is installed in the feed chamber. The operation of the nozzle and the cut-off valve are controlled by a processor performing a program based on a general principle: the valve is opened at the end of the compression stroke and is closed after the moment of ignition; fuel is injected during the power stroke. With the cut-off valve open, the direction of gas flow depends on the pressure difference between the two connected spaces. In the first period after the valve is opened, a rich fuel-exhaust gas mixture, prepared in the previous phase, leaves the feed chamber. The increase in pressure in the cylinder space, caused by the piston movement, results in the reversed flow direction even before the moment of ignition. The computer-controlled valve is closed after the mixture is ignited, and the pressure in the feed chamber is sufficient to prepare the mixture in the next cycle, the exact moment depending on the engine load. During the phases of power, charge exchange, and the first moments of compression, a computer-controlled amount of fuel is injected to the gases accumulated in the feed chamber under high pressure. The fuel vaporizes quickly in hot exhaust gases, thus producing a rich, chemically active fuel-exhaust gas mixture used in the next engine operation cycle. In a multi-cylinder engine, each cylinder has its own feed

chamber equipped with a cut-off valve and a spray nozzle.

The engine presented in the patent specification DE 4 116 303 has the feed chamber connected with the cylinder working space via feed canal and exhaust gas charging canal, leading to the cylinder wall, with its outlet being located above the upper edge of the exhaust port and below the piston top edge at the moment of ignition. The inner space of the rotary distributor constitutes the feed chamber, with the cylindrical control element driven by a non-slip transmission from the crankshaft. The wall of the control element is provided with two openings, an inlet and outlet one, spaced along the axis of the element. The openings are disposed at such a central angle and coupled with the non-slip transmission in such a position, that while the element is rotating, the inlet opening meets the exhaust gas charging canal during the power stroke and the outlet opening meets the feed canal during the compression stroke. The matings are realized when the piston is below the openings of the canals in the cylinder wall. In the plane perpendicular to the axis of rotation of the control element and taking through the inlet opening, the fuel spraying device is mounted, with its nozzle directed to the center to the feed chamber.

During the power stroke some portion of the exhaust gases flows to the feed chamber. The rotation of the control element results in closing of the exhaust gas charging canal and connecting the feed chamber via the inlet opening with the fuel spraying device. In the cylinder space the changing of the charge and flowing of the air from the crankcase is realized simultaneously. After closing the exhaust gas charging canal and inlet canals the feed chamber is connected via feed canal with the cylinder space.

The above presented engine is the one-cylinder unit. The multi-cylinder realization is the assembly of one-cylinder engines coupled with the common crankshaft together, each with its own feed chamber and fuel spraying device.

Disclosure of the invention

The engine developed by this invention prepares the combustible charge using a method similar to that described above, in DE 4 116 303 specification, however with a different design, developped to multi-cylinder unit.

The cylinder space of each cylinder is connected with the feed chamber which is formed by the inner space of a rotary distributor, which space is closed by a rotary control element driven by a non-slip transmission from the engine crankshaft. The control element has two openings, an inlet and outlet one, spaced at such a central angle, and coupled with the transmission in such a position that, when the element is rotating, the inlet opening meets the feed canal outlet in the rotary distributor during the power stroke, and the outlet opening is met in the compression stroke. The two spaces become connected when the piston is below the feed canal opening in the cylinder wall. In the feed chamber the fuel spraying device is mounted.

In the first mode of carrying out the invention the cylinder spaces are connected with one common feed chamber by means of separate feed canals, the openings of which are spaced at symmetrical pitch of the rotary distributor central angle, corresponding to the number of cylinders and the sequence of ignition. In such an engine, there are particularly advantageous conditions for gas flow, which minimize the effect of inertia. The possibility of uncovering simultaneously the inlet opening which comes from the cylinder that performs the power stroke, and the outlet opening leading to the cylinder which performs the compression stroke, creates conditions that enhance the flow - the feed chamber acts as a pressure accumulator which simultaneously discharges the fuel-exhaust gas mixture produced in it and is fed with exhaust gases. Such an operation system diminishes the importance of cutting off the controlled spaces tightly. Pressure pulsation is considerably reduced which favourably reduces wave phenomena which disturb the flow of gas.

The rotary distributor can actually be of any design. The design that is particularly advantageous has the feed chamber formed by the inner space of the control element - designed as a rotary chamber supported by bearings in the distributor body. One end of the chamber is connected with a non-slip transmission by means of a coupling and a pressure spring. The other end of the chamber, which has an inlet and outlet openings, is pressed against the cover of the body in which the opening of the feed canal is placed to mate with the two openings mentioned above. In the cover, positioned in the distributor rotation axis, there is a fuel spraying device directed towards the axially positioned opening made in the bottom of the control element.

A further mode of carrying out the invention aims at ensuring an orderly flow in the feed chamber, increasing homogeneity of the mixture at high frequencies caused by high rotation speeds of the engine and/or the high number of cylinders controlled by one distributor. In such an engine the cylinder spaces of each cylinder are connected with one common feed chamber via two canals - feed canal and exhaust gas charging canal. The control element of the rotary distributor is made as a shaft with a machined concentric chamber at the front end, closed by the distributor body cover in which a fuel spraying device is installed. The feed and exhaust gas charging canals are connected separately with two control sections of the rotary distributor; the sections are spaced along the axis of the annular wall of the shaft. The exhaust gas charging canal section has an inlet opening, and the feed canal section has an outlet opening.

The exhaust gas charging canals and the feed canals are spaced on the circumference of the rotary distributor

sections at a symmetrical pitch of the rotary distributor phase angle, corresponding to the number of cylinders and the sequence of ignition.

A further development of the invention consists in placing the outlet opening and feed canal section closer to the rotary distributor cover.

In the design presented here, irrespective of the number of cylinders, there is one direction of flow through the feed chamber, in countercurrent to the flow of the sprayed fuel; thus producing higher homogeneity of the mixture and a better flow dynamics.

Brief description of the drawings

The several examples of engine designs presented below will permit the essence of the invention to be understood thoroughly. The engines are shown schematically; the following figures show: Fig. 1 - cross section of the three-cylinder engine equipped with a rotary distributor having control openings positioned on the circumference of the control element which has the form of a hollow shaft, Fig. 2 - longitudinal section of the same engine, Figs. 3, 4, and 5 - cross sections through the engine shaft of Fig. 2; the cross sections are taken through the feed canal planes of individual cylinders, Fig. 6 - an axial cross section through another distributor with control openings located on the front surface, Fig. 7 - view of the front surface of the distributor of Fig. 6 designed to co-operate with a three cylinder engine, and driven by 1:1 transmission, Fig. 8 - a longitudinal section of a three-cylinder engine controlled by a two-sectional distributor, Figs. 9 and 10 - sections through the exhaust gas charging section and the feed canal section, respectively.

Modes of carrying out the invention

In the engine shown in Fig. 1, a working space 8 is enclosed by the walls of the cylinder 1, the head 6, and the bottom of the piston 5. The piston 5 is connected with the crankshaft 10 by means of a connecting rod 9. The crankshaft 10 is supported on bearings in the crankcase 11. On the reverse movement, the piston 5 uncovers the inlet 3 and exhaust 4 ports located in the wall of the cylinder 1. Air is sucked into the crank case 11 through a suction canal and a self-closing one-way plate valve 12. The basic design of the two-stroke engine with precompression of charge in the crankcase, as described above, is supplemented with a device for preparing the combustible load. The rotary distributor unit A is equipped with a sleeve-type control element 16 driven by 1:1 non-slip transmission 17 from the crankshaft 10. The inner space of the control element 16 constitutes the feed chamber 13 which is periodically connected with the cylinder space 8 through the inlet 18 and outlet 19 openings, and the feed canal 14. The nozzle of the fuel spraying unit 15, in this case - an injector with electromagnetic control, is built into the feed chamber 13. The feed canal 14 ends at the wall of the cylinder 1, with the opening situated slightly above the upper edge of the outlet port 4 and directed towards a hole in the head 6 where the spark plug 7 is installed. The operation of the feed chamber 13 is controlled on a geometric basis: the value of the central angle a between the inlet 18 and outlet 19 openings on the circumference of the control element 16 is slightly greater than the angle of rotation of the crankshaft 10 for the travel of the piston 5 between covering and uncovering of the feed canal 14. In the single-cylinder engine described here, the angle α equals 220°.

The description of the process occurring in the engine begins with the situation shown in Fig. 1 when the piston 5 is at the bottom dead centre during the charge exchange phase. Rotation of the crankshaft 10 and the upward movement of the piston 5 result in closing the inlet ports 3 and then the exhaust port 4 thus beginning the compression phase. Subsequently, as the feed chamber 13 is opened, a very strong pulse of a rich fuel-exhaust gas mixture flows into the cylinder space 8 through the feed canal 14 and the inlet opening 19. As the mixture stream moves towards the spark plug 7, it mixes with the air, which results in qualitative differentiation of the combustible mixture, the ultimate pattern of which is shaped by the piston 5. The opening of the feed canal 14 is closed by the piston head edge before the instance of ignition. During the power stroke, after the opening of the feed canal 14 is uncovered, the feed chamber 13 connected with the cylinder space 8 for the second time in the same cycle - this time through the inlet opening 18. Some portion of the exhaust gases flows into the feed chamber 13 which acts as a pressure accumulator and a generator of the fuel-exhaust gas mixture. The position of the opening of the feed canal 14 on the wall of the cylinder 1 controls the timing of connecting the feed chamber 13 with the cylinder space 8. In the process of preparing the combustible mixture, the connecting operation must meet two opposing conditions, the introduction of the mixture must sufficiently precede the moment of ignition and the pressure in the feed chamber 13 must reach a sufficient value.

The rotary distributor A shown in Fig. 2 has one common feed chamber 13 for three cylinders. The control element 16 has the form of a shaft with a machined concentric chamber at one end, closed by the cover 20 of the distributor body 21. In the cover 20, the fuel spraying device 15 is mounted. On the side surface of the control element 16, three sections can be distinguished, which correspond to individual cylinders. Each section has the input opening 18 and the output opening 19 in the shaft wall; the openings mate with the feed canals 14.1, 14.2, and 14.3 connecting the distributor with individual cylinders. The central angle α at which the inlet 18 and outlet 19 openings are spaced equals 240°. With three cylinders, the phase angle β representing the relative difference in the position of openings between the sections, must be 120°, in the direction opposite to the rotation of

the crankshaft 10 and in accordance with the ignition sequence. With the geometry of control adopted here, which is thoroughly explained by cross sections taken along the sections of the control element, as shown in Figs. 3, 4, 5, and with the ignition sequence being 1-2-3, the feed chamber 13 is always simultaneously connected with cylinders on the power and compression strokes. Fig. 2 shows the first and the second cylinders in this situation, connected by means of the canals 14.1 and 14.2.

Fig. 6 shows an advantageous design of the rotary distributor A. The control element 16 takes in this design the form of a chamber supported by bearings in the distributor body 21; one end of the control element 16 is connected with the shaft of a non-slip transmission 17 by means of a dog clutch 23 movable along its axis. Unlike in the distributor used in the engine of Fig. 2, where the side surface acts as the control surface, in this design the inlet opening 18 and the outlet opening 19 are situated in a flat bottom of the control element 16, which is pressed against the cover 20 by means of a helical spring 24 incorporated in the clutch unit 23. The feed canals 14.1, 14.2, and 14.3 of the three cylinders are connected to the cover 20 in which a spray nozzle 15 is installed in the centre, along the axis of rotation. In such a design the control surface also seals the feed chamber 13.

Fig. 7 shows the position of the control openings in the distributor of Fig. 6 in a three-cylinder engine with a non-slip 1:1 transmission 17. It is an obvious solution to use a reduction transmission to drive the distributor with the transmission ratio expressed by a natural number, with a resulting division of the phase angle β.

A three-cylinder engine as shown in Fig. 8 embodies a somewhat modified, relative to those described above, principle of preparing the mixture. In addition to the feed canal 14.1, 14.2, or 14.3, each cylinder is equipped with an exhaust gas charging canal 22.1, 22.2, and 22.3, respectively, ending with an opening in the cylinder wall, positioned above the upper edge of the exhaust port 4. These canals run to the rotary distributor A separately to two control sections allocated to the functions of exhaust gas transfer and mixture feed, rather than to individual cylinders. The exhaust gas flows through the feed chamber in one direction. The section with the outlet opening 19 corresponding to the feed canals 14.1, 14.2, and 14.3, is situated closer to the distributor cover 20, which ensures the counter-current flow which intensifies evaporation and mixing of the sprayed fuel with the gas stream.

In traction engines exist varying operating conditions, especially as regards the rotation speed and load. Due to the flow inertia it is expedient to control in the rotary distributor A the angle at which the feed chamber 13 is connected with the cylinder space 8. With the double control system arranged in series, both in the distributor and on the cylinder wall, some improvement can be brought about by making the inlet 18 and outlet 19 openings oval rather than round. The rotation speed can be taken into account by using a coupling with controllable delay/advance angle 25 connected to the non-slip transmission

17. In the simplest design, such a coupling 25 can be controlled by a centrifugal governor. The full range of optimal control can be ensured with the assistance of a processor-based control unit 26 which, based on signals coming from numerous sensors which scrutinize the engine operation, external conditions, the throttle position, determines the required setting of the fuel feed, controllable clutch and other controllable engine units.

Claims

1. A two-stroke multi-cylinder internal combustion engine with spark ignition, with the air charge or a lean fuel-air mixture precompression in the crankcase (11), with ports controlled by the piston; with the space (8) of each cylinder connected via

   - a feed canal (14) ending at the cylinder wall (1) with an opening situated between the upper edge of the exhaust port (4) and the position of the piston's (5) top edge at the moment of ignition
   - with a feed chamber (13) which is formed by the inner space of a rotary distributor (A) closed by a rotary control element (16) driven by a non-slip transmission (17) from the engine crankshaft (10); wherein the rotary control element (16) has two openings per cylinder, an inlet one (18) and an outlet one (19), spaced at such a central angle (a) and coupled by the non-slip transmission (17) in such a position, that, while rotating, the inlet opening (18) meets the opening of the feed canal (14) in the rotary distributor (A) during the power stroke, the connection being open when the piston (5) is below the opening of the feed canal (14) on the wall of the cylinder (1),
   - and further, a fuel spray device (15) is built inside the feed chamber (13),

   characterised in that the outlet opening (19) meets the feed canal (14) in the compression stroke, said feed chamber (13) is a common chamber for all the cylinders, the spaces (8) inside the cylinders (1) are connected with said common feed chamber (13) by means of the feed canal (14.1, 14.2, 14.3) of each cylinder, the openings of which are spaced in the rotary distributor (A) at the phase angle (β) corresponding to the division of the cycle by the number of cylinders (1), in the sequence of ignition.

2. The engine as claimed in the claim 1, characterised

in that the common feed chamber (13) is formed by the inner space of the rotary control element (16) which is designed as a rotary container supported by bearings in the body (21) of the rotary distributor (A); one end of the control element being connected with the shaft of the non-slip transmission (17) by means of a coupling (23) and a helical pressure spring (24); the other end, which has the inlet opening (18) and the outlet opening (19), being pressed against the cover (20) of the regulator body (21), the cover having an opening of the feed canal (14) mating with the inlet (18) and outlet (19) openings, and equipped with a fuel spray nozzle (15) directed towards the axial opening in the bottom of the control element (16).

3. The engine as claimed in the claim 1, characterised in that the non-slip transmission (17) has a reducing ratio expressed by a natural number, and the control element (16) has pairs of inlet (18) and outlet (19) openings spaced according to the transmission ratio.

4. The engine as claimed in the claim 1, characterised in that the coupling (25) with controllable delay/advance angle is built into the non-slip transmission (17).

5. A two-stroke multi-cylinder internal combustion engine with spark ignition, with the air charge or a lean fuel-air mixture precompression in the crankcase (11), with ports controlled by the piston ; with the space (8) of each cylinder (1) connected via

- a feed canal (14) and an exhaust gas charging canal (22), both ending at the cylinder wall with openings situated between the upper edge of the exhaust port (4) and the position of the top edge of the piston (5) at the moment of ignition
- with a feed chamber (13) formed by the inner space of a rotary distributor (A), which is closed by a rotary control element (16) driven by a non-slip transmission (17) from the engine crankshaft (10), wherein the control element (16) has two openings, an inlet one (18) and an outlet one (19), spaced at such a central angle (α), and coupled with the transmission (17) in such a position that, when the element (16) is rotating, the inlet opening (18) meets the exhaust gas charging canal (22) outlet in the rotary distributor (A) during the power stroke, and the outlet opening (19) meets the outlet of the feed canal (14) in the compression stroke, and the mating is realized when the piston (5) is below the feed canal (14) opening in the cylinder wall, a
- further, wherein a fuel spraying device (15) is built in the feed chamber (13),

characterized in that said chamber (13) is a common chamber for all the cylinders,
the spaces (8) of the cylinders (1) are connected to said common feed chamber (13) whose control element (16) takes the form of a shaft, i.e. with a concentric chamber at one end, closed by a cover (20) of the distributor body, fitted with the fuel spraying device (15), with the feed canal (14.1, 14.2, and 14.3) and the exhaust gas charging canal (22.1, 22.2, and 22.3) of each cylinder connected separately to two control sections of the rotary distributor (A), the sections being placed along the axis of the annular wall of the shaft, having an inlet opening (18) in the section connected to the exhaust gas charging canal (22) and the outlet opening (19) in the section connected to the feed canal (14), with the exhaust gas charging canals (22.1, 22.2, and 22.3) and the feed canals (14.1, 14.2, and 14.3) spaced on the circumference of the corresponding section at a phase angle (β), depending on the number of cylinders (1) and the sequence of ignition.

6. The engine as claimed in the claim 5, characterised in that the section corresponding to the outlet opening (19) and the feed canal (14), is situated closer to the cover (20) of the rotary distributor (A).

Patentansprüche

1. Fremdgezündente Zweitaktbrennkraftmaschine mit der Vorverdichtung der Luft oder einer kraftstoffluftarmen Mischung in dem Kurbelgehäuse (11) und mit einer Schlitzsteuerung, in welcher der Arbeitsraum (8) von jedem der Zylinder verbunden wird:

- mit dem Versorgungskanal (14), geleitet auf die Zylinderlaufbahn (1) durch eine Öfffnung, die zwischen der oberen Kante von der Auslauföffnung (4) und dem Standort der Kolbenkante (5) im Zündungsmoment situiert ist,
- mit der Speicherkammer (13) bestehend aus der inneren Zelle des Rotationsverteilers (A), geschlossen mit einem Rotationselement (16), das durch ein rutschfestes Getriebe (17) von der Motorkurbelwelle (10) her getrieben wird, und deren Rotations-Steuerelement (16) zwei durchgehende Öffnungen für den Zylinder hat, und zwar: Einlauf- (18) und Auslauföffnung (19), plaziert unter derartigem Zentralwinkel (α) und gekoppelt mit dem rutschfesten Getriebe (17) in derartiger Stellung, dass sich beim Umdrehen die Einlauföffnung (18) mit der Öffnung des Versorgungskanals (14) in dem Rotationsverteiler (A) während der Motorbetriebsphase deckt, wobei diese Verbindungen treten dann auf, wenn sich der Kolben (5) unterhalb der Öff-

nung des Versorgungskanals (14) auf der Zylinderlaufbahn (1) befindet darüber hinaus,

- in dem die Brennstoffzersträubende-Vorrichtung (15) in der Speicherkammer (13) verbaut ist,

dadurch gekennzeichnet, dass sich die Auslauföffnung (19) in der Phase der Ladungverdichtung mit der Öffnung des Versorgungskanals (14) deckt, die schon erwähnte Speicherkammer (13) für alle Zylinder gleich ist, die Arbeitsräume (8) der Zylinder (1) mit der schon erwähnten Speicherkammer (13) mittels einem Kanal (14.1, 14.2, 14.3) jeden der Zylinder verbunden sind, und deren Öffnungen in dem Rotationsverteiler (A) in einer symetrischen Zentralwinkel (β) -Teilung plaziert werden, was der Zylinderanzahl (1) und der Zündreihenfolge gemäss erfolgt.

2. Der Motor, nach Anspruch 1. gekennzeichnet dadurch, dass die gemeinsame Speicherkammer (13) das Innern des Rotationselementes (16) bildet, das die Form eines in dem Rotationsverteiler (A)-Gehäuse (21) gelagerten Rotationsbehälters hat, das mit einem Ende durch die Kopplung (23) und der Achse gemäss verlaufende Druckfeder (24) mit der Welle von einem rutschfesten Gertriebe (17) verbunden ist, mit dem anderen Ende dagegen - in dem die Einlauf- (18) und die Auslauföffnung (19) hergestellt wurden - stirnseitig an den Deckel (20) von dem Gehäuse (21) angelehnt wird, wobei dieser Deckel die mit der Ein- (18)- und Auslauföffnung (19) zusammenarbeitende Öffnung des Versorgungskanals (14) beinhaltet, und in dem in der Verteilerdrehachse eine Vorrichtung zur Treibstoffzerstäubung (15), die in Richtung der achsialen, in dem Boden des Steuerelementes (16) ausgefhrtenüffnung, verbaut wurde.

3. Der Motor nach Anspruch 1. gekennzeichnet dadurch, dass das rutschfeste Getriebe (17) eine um die Werte der natürlichen Zahl reduzierende Übersetzung hat, und in dem Steuerelement (16) die Paare der Einlauf-(18) und Auslauföffnung (19) hergestellt wurden, die entsprechend dem Übersetzungswert ihren Abstand halten.

4. Der Motor nach Anspruch 1. gekennzeichnet dadurch, dass in das rutschfeste Getriebe (17) eine gesteuerte Winkelkupplung (25) eingebaut wurde.

5. Fremdgezündete Zweitaktbrennkraftmaschine mit der Vorverdichtung der Luft oder einer kraftstoffluftarmen Mischung in dem Kurbelkasten (11) und mit einer Schlitzverteilung, in welcher der Arbeitsraum (8) von jedem Zylinder (1) verbunden wird:

- mit dem Versorgungskanal (14) und Presskana (122) , geleitet auf die Zylinderlaufbahn (1) durch Öffnungen, die zwischen der oberen Kante von der Auslauföffnung (4) und Stellung des Bodenrandes vom Kolben (5) im Moment der Zündung, mit
- der Speicherkammer (13), die der innere Raum des Rotationsverteilers (A) darstellt, geschlossen mit einem Rotationselement (16), das durch das rutschfeste Getriebe (17) von der Kurbenwelle (10) des Motors her getrieben wird, und dessen Steuerelement (16) zwei durchgehende Öffnungen hat: die Einlauf-(18) und Auslauföffnung (19), plaziert unter dem Zentralwinkel (α) und verdichtet durch das rutschfeste Getriebe (17) in der Stellung, dass sich beim Umdrehen vom Element (16) die Einlauföffnung (18) mit der Öffnung des Presskanals (22) in dem Rotationsverteiler (A) während der Betriebsphase des Motors deckt, und die Auslauföffnung (19) deckt sich mit der Öffnung des Versorgungskanals (14) in der Phase der Verdichtung, wobei diese Verbindungen treten dann auf, wenn sich der Kolben (5) unterhalb der Öffnungen dieser Kanäle (14) auf der Zylinderlaufbahn befindet,
- darüber hinaus, in dem die Vorrichtung zum Kraftstoffzerstäubung (15) in der Speicherkammer (13) verbaut wurde,

gekennzeichnet dadurch, dass die Kammer (13) gemeinsam für alle Zylinder ist, und die Arbeitsräume (8) der Zylinder (1) mit einer, gemeinsamen Speicherkammer (13) verbunden sind, deren Steuerelement (16) die Form einer Welle mit einem stirnseitig ausgeführten konzentrischen Hochlraum hat, verblendet mit einem Deckel (20) vom Gehäuse und mit einer in ihm aufmontierten Vorrichtung zur Kraftstoffzerstäubung (15), wobei der Versorgungskanal (14.1, 14.2, 14.3) und der Presskanal (22.1, 22.2, 22.3) von jedem der Zylinder getrennt an 2 Steuersektionen des Rotationsverteilers (A), ausgeführt in dem axialgemäss verlaufenden Abstand auf einer Ring-Mantelfläche der Wellenwand geleitet sind, und versehen mit der Einlauföffnung (18) an der Sektion des Presskanals (22) und die Auslauföffnung (19)an der Sektion des Versorgungskanals (14), darüber hinaus Abstandhalten der Presskanäle (22.1, 22.2, 22.3) und der Versorgungskanäle(14.1, 14.2, 14.3) - an dem Perimeter der jeweiligen Sektion - ausgeführt mit einer symetrischen Aufteilung des Zentralwinkels (β), die der Anzahl der Zylinder (1) entspricht, und gemäss der Zündreihenfolge.

6. Der Motor nach Anspruch 1. gekennzeichnet dadurch, dass die Sektion der Auslauföffnung (19) und des Versorgungskanals (14) dem Decke (120) von dem Rotationsverteiler (A) nääher plaziert wurde.

Revendications

1. Moteur deux temps à allumage par etincelle, à précompression de la charge d'air ou du mélange pauvre de gaz carburés dans le carter (11) et avec la distribution à orifices contrôlés par le piston, dans laquelle l'espace de travail (8) de chaque cylindre correspond à travers

   - un canal d'alimentation (14) sorti sur la glace de cylindre (1) par un orifice situé entre le bord supérieur de la lumière d'échappement (4) et la position du bord du piston (5) au moment d'allumage,
   - avec une chambre de réserve d'air (13) formée par l'espace intérieur du distributeur rotatif (A), fermée par un élément de commande rotatif (16) propulsé par la transmission à entraînement positif (17) de l'arbre vilebrequin (10) du moteur, et dont l'élément de commande rotatif (16) est muni de deux orifices de passage pour le cylindre: un d'entrée (18) et un de sortie (19), espacés sous un tel angle central (α) et accouplés par la transmission à entraînement positif (17) dans une telle position qu'au moment de rotation l'orifice d'entrée (18) s'interpose sur l'orifice du canal d'alimentation (14) dans le distributeur rotatif (A) au cours de travail du moteur cependant que ces interpositions ont lieu quand le piston se trouve au dessous de l'orifice du canal d'alimentation (14) sur la glace de cylindre (1),
   - dans lequel le dispositif de diffusion du carburant (15) est aménagé dans la chambre de réserve d'air (13),

   caractérisé en ce que l'orifice de sortie (19) dans la phase de compression de la charge s'interpose sur l'orifice du canal d'alimentation (14), la chambre de réserve d'air (13) mentionnée est commune à tous les cylindres, les espaces de travail (8) des cylindres (1) communiquent avec la chambre de réserve d'air (13) mentionnée moyennant le canal (14.1, 14.2, 14.3) de chaque cylindre, et les orifices dans le distributeur rotatif (A) sont espacés dans le pas symétrique d'angle central (β) correspondant au nombre des cylindres (1) et selon l'ordre d'allumage.

2. Le moteur, conformément à la revendication 1, caractérisé en ce que la chambre de réserve d'air (13) commune est formée par un élément de commande rotatif (16) sous forme de container palié rotatif dans le corps (21) du distributeur rotatif (A) et dont un fond est lié par l'embrayage (23) et le ressort de pression coaxial (24) au rouleau de la transmission à entraînement positif (17), l'autre fond - muni d'un orifice d'entrée (18) et d'un orifice de sortie (19) - s'appuyant frontalement contre le couvercle (20) du corps (21) qui contient l'orifice du canal d'alimentation (14) coopérant avec l'orifice d'entrée (18) et l'orifice de sortie (19), et dont l'axe de rotation du distributeur est munie d'un dispositif de diffusion du carburant (15) orienté vers l'orifice axial situé dans le fond de l'élément de commande (16).

3. Le moteur, conformément à la revendication 1, caractérisé en ce que la transmission à entraînement positif (17) a un rapport de réduction de valeur du nombre naturel, et l'élément de commande (16) est muni des paires des orifices d'entrée (18) et de sortie (19) espacés conformément à la valeur du rapport.

4. Le moteur, conformément à la revendication 1, caractérisé en ce que l'embrayage commandé angulaire (25) est incorporé dans la transmission à entraînement positif (17).

5. Moteur deux temps à allumage par etincelle, à précompression de la charge d'air ou du mélange pauvre de gaz carburés dans le carter (11), avec la distribution à orifices contrôlés par le piston, dans laquelle l'espace de travail (8) de chaque cylindre correspond à travers

   - un canal d'alimentation (14) et un canal de refoulement (22) sortis sur la glace de cylindre par des orifices situés entre le bord supérieur de la lumière d'échappement (4) et la position du bord du piston (5) au moment d'allumage,
   - avec une chambre de réserve d'air (13) formée par l'espace intérieur du distributeur rotatif (A), fermée par un élément de commande rotatif (16) propulsé par la transmission à entraînement positif (17) de l'arbre vilebrequin (10) du moteur, et dont l'élément de commande rotatif (16) est muni de deux orifices de passage: un orifice d'entrée (18) et un orifice de sortie (19), espacés sous un tel angle central (α) et accouplés par la transmission à entraînement positif (17) dans une telle position qu'au moment de rotation de l'élément (16) l'orifice d'entrée (18) s'interpose sur l'orifice du canal de refoulement (22) dans le distributeur rotatif (A) au cours de travail du moteur et l'orifice de sortie (19) s'interpose sur l'orifice du canal d'alimentation (14) dans la phase de compression de la charge, cependant que ces interpositions ont lieu quand le piston (5) se trouve au dessous des orifices de du canal (14) sur la glace de cylindre,
   - dans lequel le dispositif de diffusion du carburant (15) est aménagé dans la chambre de réserve d'air (13),

   caractérisé en ce que la chambre (13) est commune

à tous les cylindres, les espaces de travail (8) des cylindres (1) forment une seule chambre de réserve d'air (13) commune, dont l'élément de commande (16) représente un arbre avec une cavité concentrique creusée frontalement et recouverte par le couvercle (20) du corps et avec le dispositif de diffusion du carburant (15) incorporé; le canal d'alimentation (14.1, 14.2, 14.3) et le canal de refoulement (22.1, 22.2, 22.3) de chaque cylindre sont amenés séparément des deux sections de commande du distributeur rotatif (A) réalisées en intervalle coaxiale sur la surface latérale de la paroi annulaire de l'arbre et qui sont munies d'un orifice d'entrée (18) sur la section du canal de refoulement (22) et d'un orifice de sortie (19) sur la section du canal d'alimentation (14); l'espacement des canaux de refoulement (22.1, 22.2, 22.3) et d'alimentation (14.1, 14.2, 14.3) - sur le circuit de la section - est réalisé avec le pas symétrique d'angle central (β) correspondant au nombre des cylindres (1) et selon l'ordre d'allumage.

6. Le moteur, conformement à la revendication 5, caractérisé en ce que la section de l'orifice de sortie (19) et du canal d'alimentation (14) est situé plus près du couvercle (20) du distributeur rotatif (A).

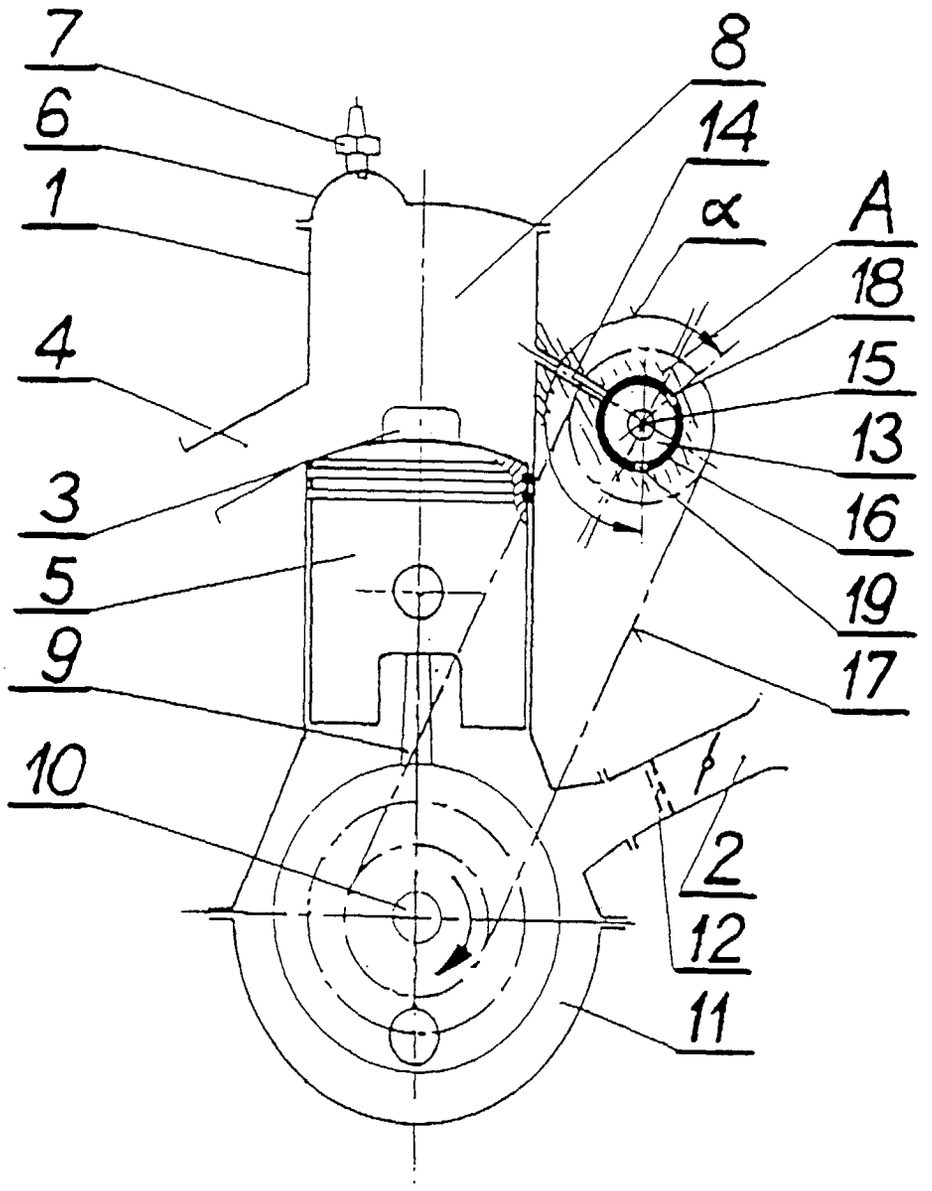


fig.1

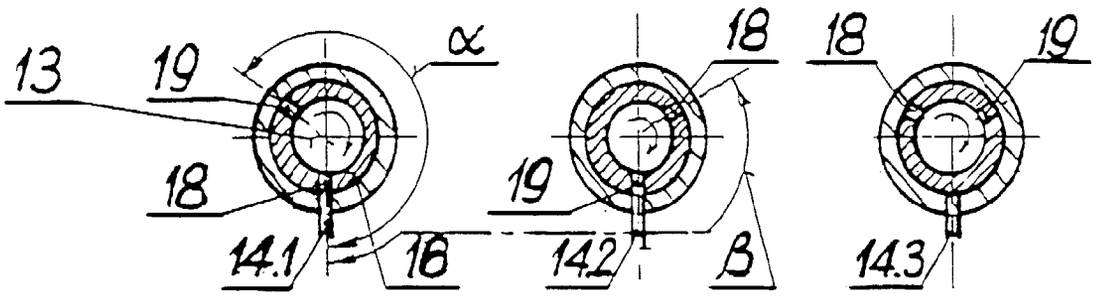


fig.3 fig.4 fig.5

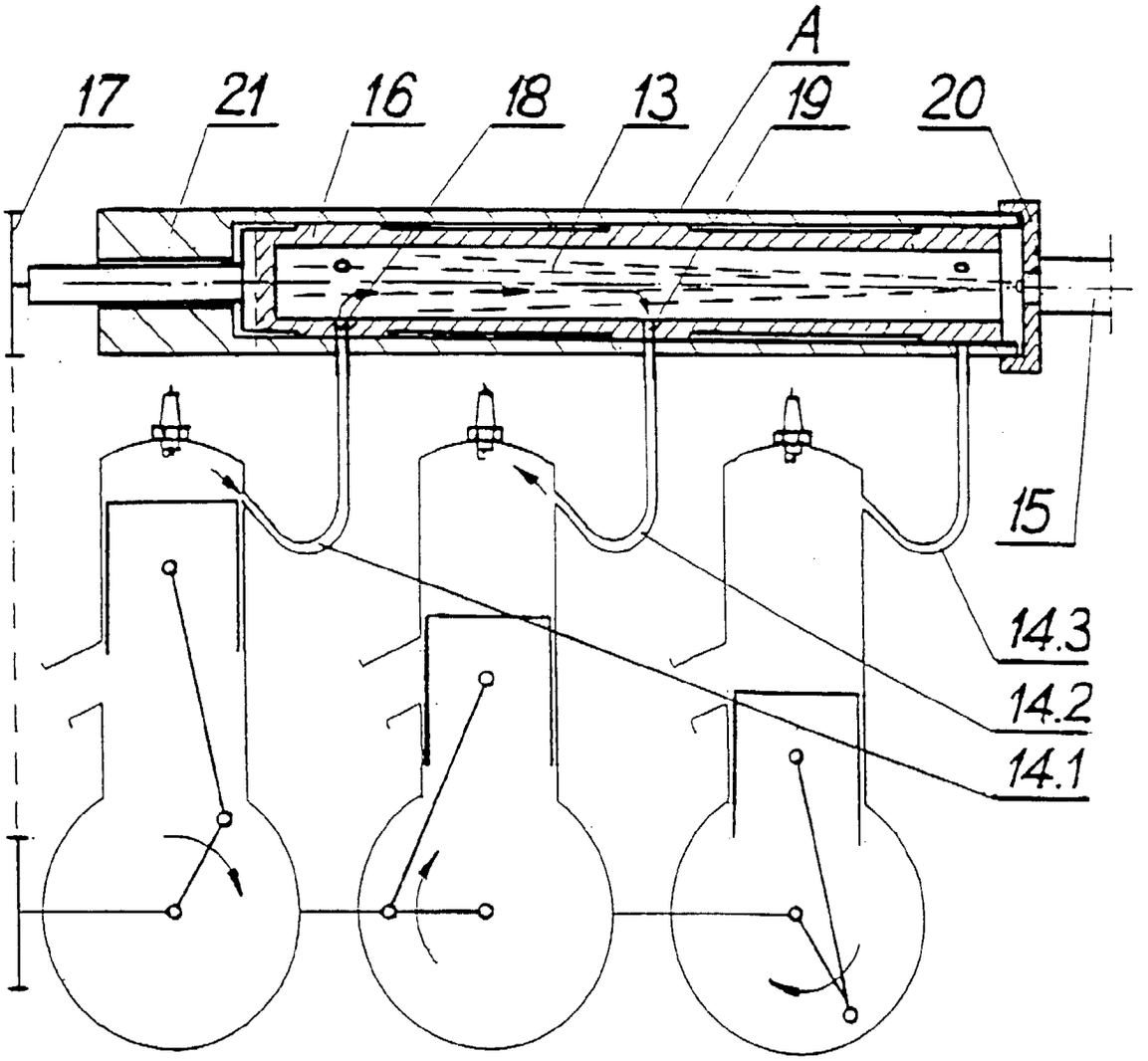


fig.2

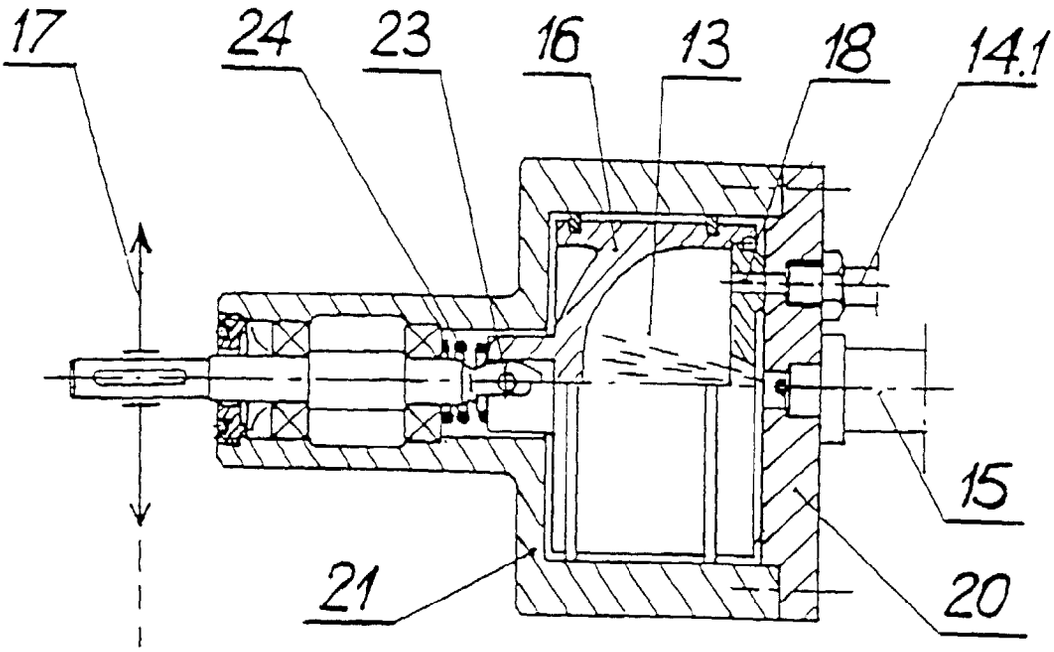


fig. 6

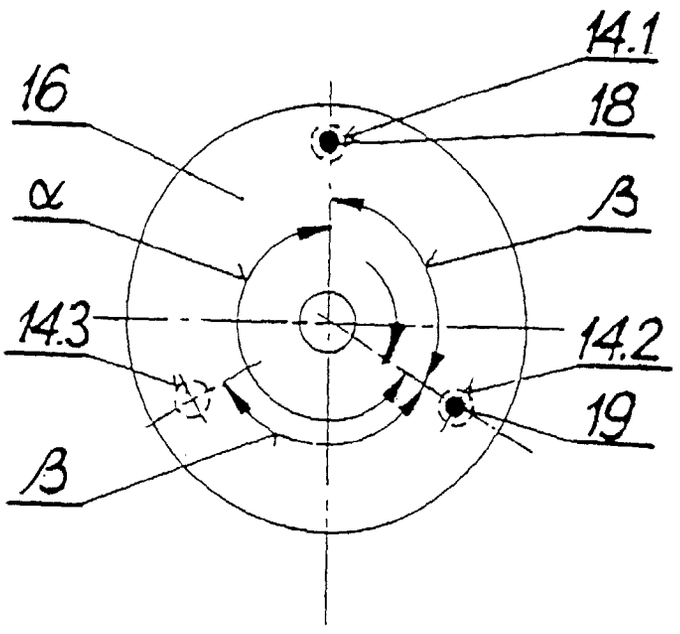


fig. 7

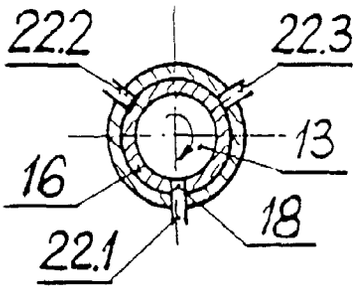


fig.9

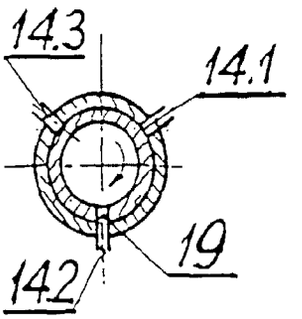


fig.10

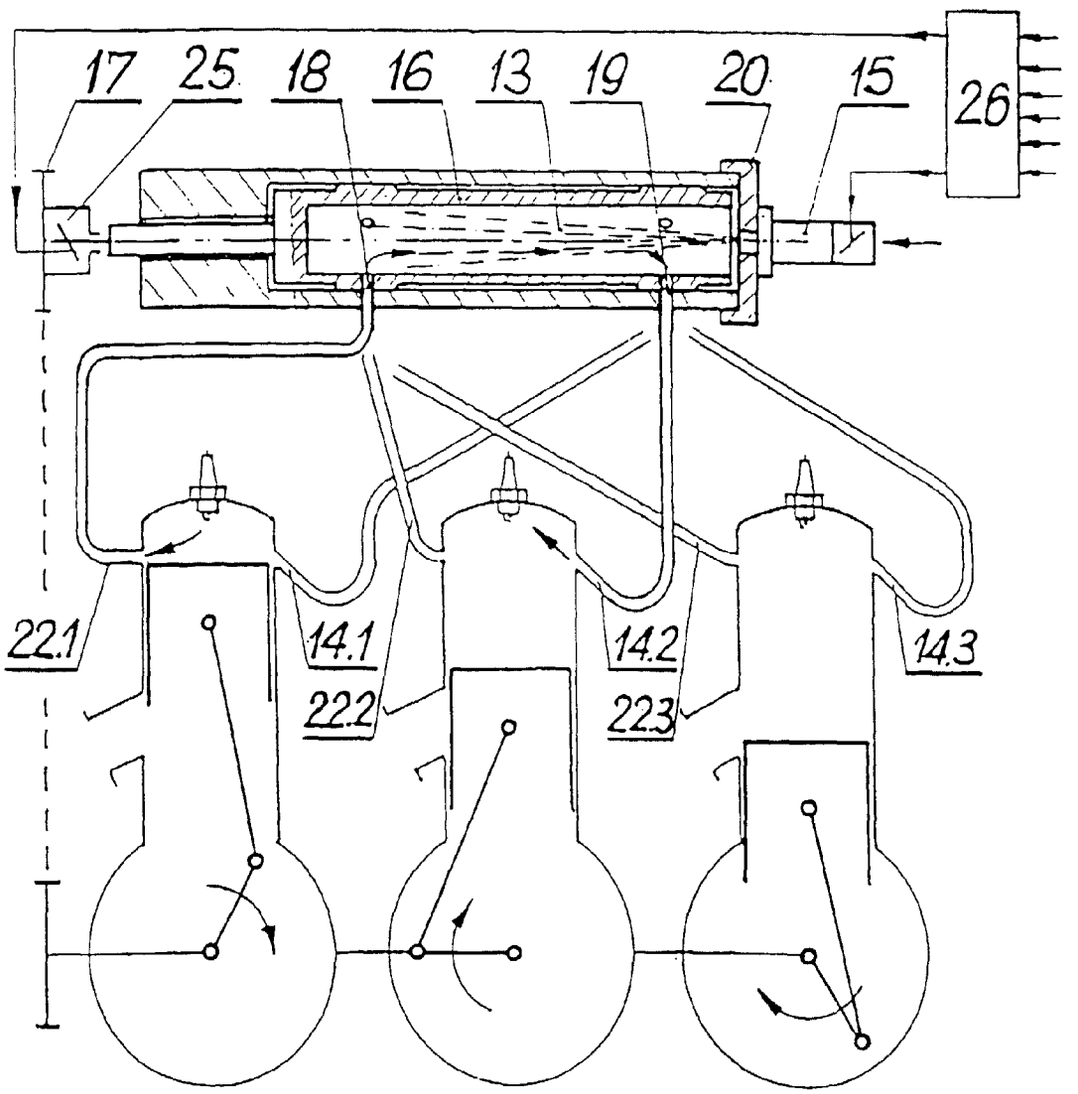


fig.8