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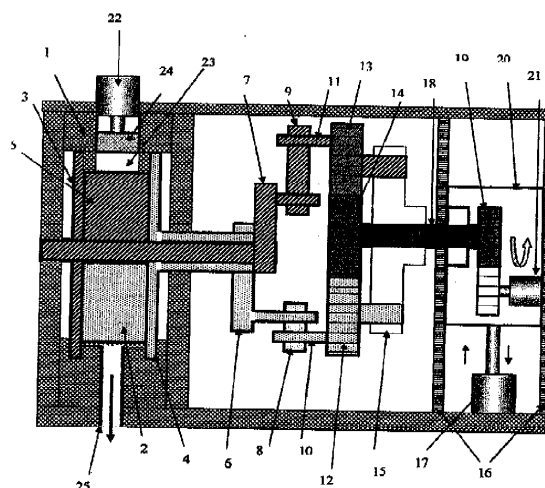
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(54) **SYSTEM FOR CONSTRUCTING ROTARY COMPRESSORS AND MOTORS WITH DYNAMICALLY VARIABLE VOLUMETRIC DISPLACEMENT AND COMPRESSION RATE**

(57) The present invention refers to a system for the construction of compressors and rotary engines comprising two rotors with one, two or more displacers per rotor, so as to create between the displacers two or more chambers. The chambers vary in volume according to the degree of separation between the piston caused by the varying and alternatively opposite velocities between the two rotors. This speed variation can be produced by various kinds of systems that are characterized by the length variation of the radius in which a regular and uniform rotary motion is transmitted or received transforming it into an oscillating motion, of varying speed, or vice versa. The new system is characterized by using jointly or separately two mechanisms. One dynamically modifies the distance between the displacers by placing the drive mechanism or the engine on the slide rails and moving it by means of a spindle, a hydraulic piston or geared system and the other dynamically modifies the beginning of the suction and compression phases preventing sealing the displacers in certain segments of the suction-compression chamber, removing a segment of the chamber by means of a drive, similar to the first one, creating a fixed or variable opening, allowing passage of fluids and preventing its displacement. The joint work of these two mechanisms monitored by a computer system powered by the sensors, enables the engine or compressor to change dynamically their parameters for an improved and efficient utilization of energy.

Figure 3



Description

FIELD OF THE INVENTION

[0001] The present invention refers to a system for the construction of compressors and rotary engine composed of two rotors with one, two, or more displacers per rotor, so as to create among the displacers two or more chambers, depending on the amount of displacers per rotor. The chambers vary in volume according to the degree of separation between the pistons, caused by varying and alternatively opposite velocities between the two rotors. This variation in speed can be produced by several types of systems that have as a characteristic the variation of the length of the radio, in which a regular and uniform rotary movement is transmitted, transforming it into an oscillating movement of varying speed or vice-versa. As an example of this kind of mechanism, we can enumerate those composed of a double crankshaft articulated with sliding or rotating rods, which operates in opposite positions articulating with the arms attached to each of the rotors and away from their geometric axis. This detachment permits the variation of the radius length in which the movement is transmitted, thereby transforming a uniform movement of the double crankshaft in a varied movement of acceleration and deceleration in the rotors with their displacers or vice versa. In the very manner that systems using a fixed solar gear around which planetary gears move, that support axes from their centre. These axes are connected to the arms of the rotors through connecting rods that transmit movement. Another mechanism utilizes elliptic gears connected to the arms of the rotors by means of rotating rods.

[0002] The new system is characterized by using jointly or separately two mechanisms. One of them modifies dynamically the distance between the displacers and the other modifies dynamically the beginning of the suction and compression phases. The alteration of the displacers' distances is obtained through the dynamic modification of the distance between the geometric axes of the drive mechanism and of the engine or compressor, placing at least one of them on sliding rails and moving it by means of a spindle, hydraulic piston or a geared system. The displacers will approach each other or separate themselves, increasing or decreasing the compression rate just as this innovation proposes.

[0003] The other mechanism alters the volume displaced in the admission and compression chambers, changing consequently the volumetric relation with the combustion and exhaust chambers. This difference of volumes is carried out preventing the sealing of the displacers in certain segments of the suction-compression chamber, by means of a separation between them, creating an opening that permits a passage of the fluids and blocks the suction and compression of them by the displacers.

[0004] This way it is possible to reduce the displaced volume in a fixed way, using a definite depression in at

least one of the walls of the chamber, which amplifies the entrance of the suction, for example (fig 1-a), or in a variable manner through the displacement of one or various sectors of the chamber that approaches or moves themselves away from the action of the displacers by means of some mechanical system, forming an opening between itself and the displacers, reducing the sealing areas of the chamber (Fig 1-b). This alteration of displaced volume can be modified, whether the system is stalled or in movement.

[0005] The joint operation of these two mechanisms permits the decrease or increase of the displaced volume in the suction phase not to alter in an undesirable manner the compression rate of the engine or the compressor. For this it is necessary to reduce or increase the compression rate making it adequate to the new admitted volume. Supposing we wish to work with a compression rate from 1 to 9, and we utilize a drainer in one of the walls of the chamber in a way that this drainer only proceed and compress 50% of the total volume, in these terms the compression rate will fall to half (1 to 4,5). It will be necessary to reduce the distance between the displacers so as to reach again a compression rate of 1-9. In this way we will have a reduction of the sucked volume, but we will maintain the desired compression rate, at the time that we will have the double of the volume in the combustion and discharging chambers. In these terms, if one or various segments responsible for the reduction of the suction-compression chamber were repositioned permitting bigger angles of operation of the displacers, the compression rate should be altered again, which will increase proportionally to the increase of volume of the displaced fluids.

[0006] The movement of these segments of the chamber may be manual, mechanical, or hydraulic by means of an adequate electric engine, which obeys a computerized program with pre-established answers, nurtured by reading of sensors of temperature, speed, torque, burning quality, etc, and other information provided. This way there can be a modification of the displaced volume in the suction and the compression and jointly the very compression rate of an engine, or of a compressor, for example, during its functioning, optimizing its productivity.

[0007] So it will be possible, in high speed, to increase the volumetric efficiency of the system, making it adequate to the different velocities.

[0008] By reducing the sucked and compressed volume, in the case of a combustion engine, the relation of size with the combustion and exhaust chambers changes automatically in its own time, so permitting the increase of time and volume to accomplish the process, ensuring a bigger use the expanded gases and a better burning of the mixtures. A difference which will result in an increase of productivity and reduction through an efficient burning of toxic residue (CO₂, Hydrocarbons) common in a bad combustion.

THE STATE OF THE TECHNIQUE AND THE PRESENT INVENTION

[0009] The energetic and ambiental crisis caused by pollutant technologies of low energetic productivity requires new equipments in the field of compressors and engines that lessens the ambiental impact, reducing to the lowest the harmful emissions and making maximum usage of the consumed energy. The utilization of new renewable fuels like biodiesel, ethanol, hydrogen or other less polluter fuels like natural gas, requires combustion engines that can operate efficiently with all of them, that is, with the ideal compression rates for each one.

[0010] On the other hand, the present internal combustion engines (alternative or rotary) do not work with the ideal compression rate for each speed-torque situation; on the contrary, they are adjusted so as to avoid pre-detonation. Turbines have been adapted to provide air at a higher pressure than the atmospheric, thus getting a good respiration of the engines, increasing their volumetric capacity. But these turbinated engines have limits to increase their volumetric capacity, marked by the increase of the compression rate that is possible to reach without damaging the engine itself. To change significantly the volumetric displacement in alternative engines in a variable manner is a task very hard to accomplish, seeing that the four phases: suction/compression/combustion/ exhaust passes on in the same cylinder, in the Otto cycle, as in the two timing or when the four phases happen in the same cylinder. On the other hand the alternative engines loose nearly 20% of the burning gas pressure, by having to open the discharge valves beforehand, generally 60 degrees before the final course, with the intention of facilitating the exhaust gases and allowing the suction cycle not to be obstructed by them. The burning of the mixture is also impaired by the geometry of the alternative engines, which cannot have combustion cylinders of bigger volume, capable of making better use of the burning expansion and efficiently complete it, in such a way as not to produce high indexes of polluting residues. To attenuate the effects of the bad burning of fuel and eliminate part of the hydrocarbon, CO₂, etc, filter catalyzers have been developed, which, besides the high cost and short time of use, do not resolve efficiently the emission of polluting gases.

[0011] On the other hand "flexible" engines have been developed which, through an electronic pre-programming, alter the parameters of powering and ignition according to the reading of sensors, adjusting them to different types of fuels. The electronic mechanisms make the combustion engines flexible, but they cannot comprehend very different kinds of compression fuel (diesel and gasoline, for example) and they cannot get good productivity for any of them, seeing that the compression rate remains fixed, preferably apt for a fuel that requires less compression.

[0012] The dynamic variation of the displaced volume in the phases of suction and compression, together with

the dynamic variation of the compression rate, the utilization of combustion and exhaust chambers of bigger volumetric capacity than that of the suction-compression, offer an interesting solution. In the case of internal combustion engines, it will allow a bigger energetic use and a significant reduction of toxic residues from the burning besides the utilization of different fuels in an optimized manner, using the specific compression rate for each one of them.

[0013] The variation of compression rate while the engine is functioning at different revolutions per minute, taking into account the information emitted by different sensors (operating temperatures, torque, types of fuel, richness of mixture, burning efficiency, etc) will permit the best use of different fuels without the risk of pre-detonations. The present invention also allows the changing of position of the intake and exhaust ports in relation to the displacers' positions. This is possible when you use a planetary system through the modification of the angular position of the solar gear in relation to the satellite ones. This new system permits also the incorporation of a very much more efficient mode of a powering turbine, now not limited in its performance by the increase of the compression rate which is dynamically variable. Lastly, reducing the suction-compression chamber, we create a space within it where the air fuel and preheated mixture is homogenized before being compressed. This guarantees better conditions for a complete and faster burning, which will result in a bigger and cleaner energetic efficiency. In the case of this system being used for compressors, it will permit the compression with different rates and volumes with which it works. In the case of refrigeration compressors, for example, today controlled by thermostats or by expensive systems of speed variation, it will permit an efficient control of required temperature, modifying the rate and/or the displaced volume, thus reducing the energetic consume and increasing the useful life of the electrical engines not obliged as in the use of thermostats, to continuous stops and take-offs that increase the energetic consume and lessen the useful life of the equipments.

[0014] Several types of compressors and rotary engines have been invented based on the motion of two rotors with at least one piston each, moving at varying and alternatively opposite speeds. This movement of change of speed is done through different mechanisms from which we can basically enumerate:

- 1) Planetary gear systems
- 2) Systems with elliptical gears
- 3) Systems with sliding rods
- 4) Systems with rotating rods

[0015] All of them assume established relation of eccentricity, and in the case of using planetary mechanisms, fixed concentric relations to the geometric axes of the engines. Many rotary engines with mechanism of relative speed variation between the two rotors based on

the use of planetary gears were idealized. All of them work with a fixed solar gear around which turns at least two satellite gears in opposite positions. The said gears support the axis distant from their centers, which articulate themselves to the arms of the rotors through rotating rods transmitters of movement. The relation of reduction between the solar gear and that of the satellite is determined by the quantity of displacers that support each rotor, being 1 to 1 when supporting one displacer each, 2 to 1 with two displacers per rotor and so on successively. The distance and the relative position of the center of the satellite gears of the axes, united to them, the length of the rotors' arms and rods that transmit movements, determine the variation of relative speed between the rotor and their respective displacers. The united axes distanced from the center of the satellite gears, when turning around the solar gear, approach and depart alternately from it changing the length of the radius in which the movement is transmitted, provoking a change of velocity and inclusive in certain relations and positions, provoking even the detention of one of the rotors.

[0016] The planetary systems were always projected to work in concentric forms to the engine axis, complying with a concept of simplicity, strength and ultimate smaller size of the machine. In this manner, the solar gear was firmly united on the carcass of the engine and concentric to its geometric axis. The present innovation proposes to dynamically keep at a distance the planetary mechanism of the engine or compressor, so as to change the compression rate. To be able to separate the geometric axes using more than one displacer per rotor, the present invention proposes to use a gear reduction between the arms and the rotors, proportional to the number of displacers per rotor.

[0017] This kind of reduction also should be applied in cases where double crankshafts are used articulated with the arms of the rotors by means of sliding elements that move themselves from that of the crankshaft or by double crankshaft articulated with the arms of the rotors by means of rotating rods transmitters of movement. Both mechanisms need a reduction gear when at work with more than one displacer per rotor seeing that they produce a velocity oscillation at each 360 degrees, which makes them incompatible to operate in the cases where there is need for 180 degrees cycles as in the case of rotors that support two displacers each.

THE PRESENT INVENTION

[0018] Together with more than the traditional advantages that the rotary engines offer in relation to the alternatives, that is: smaller size, lesser amount of movable parts, less vibration, less weight, less production cost, the new engine points to a bigger energetic use and a significant reduction of quality and quantity of toxic residues due to burning.

[0019] This is possible for various reasons:

1. For this renovating system to permit having a combustion chamber with bigger volumetric capacity than that of suction-compression and thus able to better make use and burn the pressure of fluids in the phase of expansion or combustion.

2. For this renovating system to permit a variation of displacement reducing significantly fuel consummation and consequently the pollution sent off, suiting the displaced volume in the way programmed to the needs of the vehicle, in the case of the engine and of the equipment, in the case of a compressor, to work in the best regimes, guaranteeing a better energetic efficiency for each velocity-torque situation.

3. For this renovating system to permit together the variation of the distance between the geometric axis of the engine and the geometric axis of the actuation mechanism, during the functioning it becomes possible to change the compression rate, attending to the necessity of the torque and speed and, increase or decrease of the displaced volume (displacement) and to the type of fuel in use. We will have a compression rate closer to the ideal one for the combustion, attending to each situation and consequently we will obtain a better burning with better toxic residues, and definitely a bigger energetic use than the present engines.

4. For this renovating system being able to vary the angular relation between solar gears and satellite ones, a more efficient control of the position of the displacers is possible, in relation to the chambers and the suction and exhaust ports and spark plug, in relation to the displacers, changing the geometry in different moments of functioning, so permitting the best production in relation to velocity, displaced volume, torque required to the engine, type of fuel, etc.

[0020] In one of its preferential realization, the present innovation proposes, besides the possibility of using other speed variation mechanisms, two substantial modifications that create a new drive mechanism more versatile, permitting together or separately, the establishment of different relation of varied movement between the rotors with their displacers, as well as, also to control the distance between the displacers.

[0021] The first one consist in separating the engine's planetary gear system so that, with some of them in movement, it will be possible to change the distance between the geometric axis of both and so control the distance between the displacers united to the rotors.

[0022] Doing this, we create a new mechanism governed by two systems of varied movement. One created by the planetary mechanism and another by the detachment of the geometric axes of the engine or compressor and of the movement mechanism united by connecting rods.

[0023] The type of combination of these two speed variation mechanisms will make possible the modification of the parameters of rotors movement and their respec-

tive displacers, according to requirements of the best engine functioning in different torque and velocity regimes, using different fuels such as gasoline, ethanol, gas, that have different burning time, the relative position between the pistons, the time in which we maintain a same compression rate, the speed in the phases of suction, compression, combustion and exhaustion.

[0024] This will allow the perfection of the varied movement mechanism in the different phases for a bigger energetic use and a reduction of burning pollutant residues.

[0025] But it will be possible to unite these two mechanisms when we work with two or more displacers per rotor, with modifying the traditional planetary system that needs to use satellite gears of diameters proportional to the solar ones according to the quantity of displacers that the rotors support. In the case of two displacers per rotor, the planetary systems were designed to work with satellite gears that have half the diameter of that of the solar. So being, it produces two different cycles of speed variation for each evolution made around the fixed solar gear. If we detach the geometric axis of this ensemble, united by connecting rods that transmit movement to the arms of the rotors of the engine geometric axis, we would produce another speed variation cycle that operates at each 360 degrees. Both working together necessarily generate different and disharmonious movements between the rotors. It is for this reason that this innovating mechanism, in one of its preferential realizations, proposes a unique planetary gear system, with an equal diameter between the planetary gears and the solar ones in such a way that produces only one 360 degrees cycle compatible with that provoked by the rods system. When two displacers per rotor are utilized, the new system proposes to intermediate the movement of both, by means of a gear reduction from two to one, putting a gear of half the number of teeth on the axis of the arm of each rotor and a gear with double amount of teeth in each rotor, that transform a variation cycle of 360 degrees in two cycles of 180 degrees.

[0026] In the case of using more displacers per rotor, this decrease will be proportional to the number of displacers used, from 3-1 for three displacers, 4-1 to four displacers per rotor, and so on.

[0027] In one of its preferred realization the new system places the double crankshaft supporting the satellite gears and the solar gear axis fixed on a bearing able to be moved on rails or sliding axis by means of a spindle, a hydraulic, pneumatic or geared system, headed by a computer which is properly powered of data by sensors. And so changing the distance between the geometric axis of the engine and the geometric axis of the double crankshaft that revolves around the solar gear it is possible to change the distance between the displacers and thus change the compression rate.

[0028] In one of its preferred realizations, this innovative system for the construction of compressors and rotary engines, offers the possibility to change the displaced volume, by distancing displacers of certain seg-

ments of the chamber in a fixed or variable manner so as to prevent in these areas the suction and compression of fluid. At least a portion of the chamber at the beginning of the suction-compression, is moved in a sliding manner by means of a spindle, a hydraulic, pneumatic or geared system, so that this displacement create or close the opening between the displacers and the chamber, allowing the passage of fluids.

[0029] By increasing the volume sucked, for example, if we do not change the degree of detachment of the displacers, we would increase automatically the compression rate with which we would run the risk of certain pre-detonation in certain regimes. That is why the two mechanisms, the one that allows changing the geometry of the chamber so as to vary the displaced volume and the one that enables changing the compression rate, are technically impossible to be conceived separately.

[0030] Changing the distance between the geometric axes, we will modify the compression rate to maintain, for example, the same compression rate of the engine, which can be done with the engine stalled or moving.

[0031] In one of its preferred realizations, these operations can be controlled by a computerized system, which operating together with the variation of the displaced volume, taking into account speed - torque - fuel used, temperature, fuel type, will command the necessary changes to better and more efficient and clean energy use, as never has been achieved with current technology of combustion engines

[0032] The present innovation offers more in one of its preferred realizations a new mechanism capable of varying the relative position of the displacers in relation to the chamber and its inlet and exhaust port and spark plugs. It consists of placing the solar gear on an axis that can be moved and fixed in different positions, so as to change the relative position of the satellite gears and their respective axis attached to connecting rods that transmit motion. By changing the position of the axes of the solar gear, it also modifies the relative position of the displacers in relation to the fixed chamber with its suction and exhaust port and spark plug.

[0033] By linking this axis to any mechanical system, capable of moving the solar gear by means of a suitable engine or vary the relative position of the chamber it will be possible to perform these adjustments during operation of the engine. These adjustments could undoubtedly be operated by a programmed electronic unit, in relation to data sent by the sensors, to properly position the solar gear with the intention to improve its functioning. The present invention provides in one of its preferred realizations, a system for the construction of compressor and rotary engines with different volumetric displacement between the suction and compression chambers and the combustion and exhaust chambers. The relation of the volumetric capacities of the suction and compression chamber and compression and exhaustion ones can be fixed or variable.

[0034] In another of its preferred realizations, the

speed variation can be produced by various types of mechanisms that have the characteristic of varying length of the radius in which it is transmitted or received a regular and uniform rotary motion transforming it into an oscillating motion or vice versa. As an example of such systems, we can mention those composed by a double crank shaft with sliding rods or rotating rods working in opposite positions, articulating with the arms attached to each of the rotors and spaced away from their geometrical axes. This distance allows the variation of the length of the radius in which the movement is transmitted, thereby transforming, a continuous movement of the double crankshaft, in a varied movement of acceleration and deceleration, and stops in the rotor with their displacers or vice versa, using any of these mechanisms, characterized by the fact that the compression rate can be changed dynamically, changing the distance between the geometric axes by means of a sliding mechanism, moved by a spindle, a hydraulic, pneumatic piston or a geared system. The connecting rods that transmit motion are articulated directly when the rotors support only one displacer each (fig. 3), and/or will be mediated by a geared reduction when working with two or more displacers per rotor (fig. 1, 2).

[0035] In another preferred realization, the movement mechanism works with a double crankshaft, which supports two gears with the same number of teeth linked by a chain. Axes distanced from the center of the satellite gears are articulated with the arms of the rotor by means of connecting rotary rods that transmit motion. Geared reductions proportional to the number of displacers are applied when the rotors support more than one displacer each.

[0036] In another preferred realization of the system of the present invention, the same is used for the construction of pumps and compressors of all the different types of fluid, internal combustion engines, thermal, hydraulic or pneumatical.

A BRIEF DESCRIPTION OF FIGURES

[0037] Figure 1-a and 1-b refers to a view of a frontal section of an engine (left side) and its movement mechanism (right side) designed separately to facilitate its understanding. The engine has two rotors with a pair of displacers each (2) and (5), moving inside the chamber (1), two ports: a suction one (26) and an exhaust one (25), a drainer at the beginning of the suction (23) limits the action of the displacers. On one side, a segment of the chamber (24) articulated with the outer ring (1) placed in the fixed outer wall of the chamber driven by a hydraulic piston (22) is closed in Figure 1-a and open in Figure 1-b. The hydraulic device (22) opens a segment of the chamber, creating a ditch preventing the action of the displacers (2-5) reducing about 50% the volume to be displaced and compressed in the compression and suction chamber (34), while it increases to double the relative volume of the combustion-exhaust chamber (35). The

combustion chamber where the spark plug is (32) works with a compression rate (27) of a nine to one in Figure 1-a and changes to half approaching displacers in Figure 1-b in order to compensate for the decrease of displaced volume maintaining the same compression rate. This change is operated modifying dynamically the distance between the axes (33) between the engine (left side figure) and the movement mechanism (right figure).

[0038] The movement mechanism is a double crankshaft (15) that carries two satellite gears (12-13) which move above a fixed solar gear (14). Rotating rods (8-9) transmit the movement of the inner and outer rotors' arms (6-7). These arms are connected to the rotors by means of gears (30-31) of the half amount of teeth installed to the rotors (28-29) so as to change a cycle speed range of 360 degrees in two cycles of 180 degrees each. Thus every 180 degrees of double crankshaft displacement, the four faces of the Otto cycle are produced. The admission-compression always operates in the sector (34) of the engine and combustion-discharge in the sector (35) of the engine. It is observed that in fig. 1-b the said chamber (35) has twice the volume compared to the admission-compression chamber (34) allowing a better use of the combustion gases. In figure 1-b it is observed the amplification of a section of the chamber (23) where the air fuel mixture is heated, homogenized before being compressed.

[0039] Figure 2 refers to a perspective view of the same engine, shown in the previous figure. Figure 3 refers to a cut in a superior view of a compressor with two rotors, an inner one (3) and an outer one (4) each with a displacer (5:02) working within a fixed outer ring (1) supporting in a sliding manner a section of the chamber (24) driven by a hydraulic mechanism (22) so as to create a gap (23) that prevents or not the action of displacers (2-5) and so modify dynamically when necessary the displaced volume. The rotors (3-4) are attached to arms (6-7) which are articulated by means of rotating rods (8-9) with the satellite gears (12-13) by means of axes attached to them (10-11) distant from the centers of the satellite gears that rotate around a fixed solar gear (14).

[0040] The satellite gears (12 and 13) are supported by a double crankshaft (15) which revolves around the solar gear axis (18) carrying a gear (19) which can be moved by an electric engine (21), with the objective of modifying, when necessary, the relative position of displacers (5-2) in relation of the camera (1).

[0041] The entirety of speed variation mechanism is found firmly attached to a bearing system (20) which can be moved on rails (16) by a hydraulic mechanism (17) to thereby change the distance between the axes of the compressor and the double crankshaft with its planetary system and thus remove or approach the displacers (2:05) by changing the compression rate.

[0042] Figure 4 refers to a frontal section of a compressor with two rotors supporting a displacer each (2-5) moving in a counterclockwise direction into a chamber (1) divided into two chambers, one for suction and the other

compression. Two mechanisms that move by means of hydraulic pistons (22) segments of the chamber (24) one found opened (23) and the other closed. In figure 4-a the suction in the chamber through the port begins (26) while the compression in the other chamber begins. Figure 2b there is an intermediate state and in the figure 4-e the maximum compression of the chamber between the two displacers meets the exhaust port (25) but the displacer (5) has not yet initiated the operation of suction-compression.

In the figures, the reference numerals are:

[0043]

- 1 - Outer ring of the chamber;
- 2 - Displacers of the outer rotor;
- 3 - Internal Rotor;
- 4 - External Rotor;
- 5 - Displacers of the inner rotor;
- 6 - Outer arm rotor;
- 7 - Inner arm rotor;
- 8 - Rotating rod of the external rotor;
- 9 - Rotating rod of the internal rotor;
- 10 - External satellite gear axis;
- 11 - Internal satellite gear axis;
- 12 - External satellite gear;
- 13 - Internal satellite gear;
- 14 - Solar gear;
- 15 - Double crankshaft;
- 16 - The planetary mechanism chute;
- 17 - Hydraulical mechanism;
- 18 - Solar Gear Axis;
- 19 - Gear to move the solar gear;
- 20 - Rotary rod of the external rotor set;
- 21 - Sliding bearing of the movement mechanism;
- 22 - Hydraulic mechanism of the outer ring of the chamber;
- 23 - Ditch of the suction-compression chamber;
- 24 - Segment of the outer ring of the chamber;
- 25 - Exhaust port;
- 26 - Inlet port;
- 27 - Maximum compression rate;
- 28 - Larger gear of the inner rotor;
- 29 - Larger gear of the outer rotor;
- 30 - Smaller gear of the inner rotor arm;
- 31 - Smaller gear of the outer rotor arm;
- 32 - Spark Plug;
- 33 - Distance between the geometric axes;
- 34 - Suction-compression sector of the chamber;
- 35 - Exhaust-combustion sector of the chamber;

Claims

1. System for the construction of compressors and rotary engines comprising two rotors with at least one displacer each, which move inside an annular sur-

face, at varying speeds alternately opposed to each other, creating between them chambers that alternatively vary their volume, **characterized by** the fact that the distance between the displacers as well as areas of the chamber where the suction and compression operate, can be changed dynamically in order to vary separately or jointly the displaced volume and compression rate.

2. System in accordance with the previous claim **characterized by** the fact that at least one area of the suction and compression chamber can be changed in a fixed or variable manner, by moving at least a portion of the surface of the chamber, creating a ditch which prevents action of suction and compression of the displacers. The said segment, duly sealed, can be moved by an appropriate mechanical, hydraulic or electrical system being the entire set in an inactivated state or in motion, either manually or monitored by a computerized system.
3. System in accordance with the previous claims **characterized by** the fact that it can be constructed with different mechanisms of variation in speed of the double crankshaft type with sliding elements articulated to the arms of the rotors, or by double crankshaft attached to the arms of the rotors by connecting rods that transmit motion, or by means of planetary gears which move around a fixed solar gear articulating to the arms of the rotors by means of connecting rods that transmit movement, or by elliptical gears attached to the arms of the rotors, articulating the arms of the rotors by means of rods that transmit motion.
4. System in accordance with claim one and three **characterized by** the fact that the geometric axis of the compressor or engine may be spaced from the geometric axis of the mechanism that allows variation of speed relative to both rotors, dynamically, moving at least one of the parts on a rail or sliding axis, through a spindle, a mechanical, hydraulic, pneumatical or electrical system, being at rest or in motion, either manually or under computer program monitored by temperature sensors, speed, torque, burning quality, displaced volume, etc. aiming to alter the distance between the displacers and thus modify the minimum volume of the chambers created between them.
5. System in accordance with the claims 1,3 and 4 constructed with a movement variation mechanism comprising fixed a solar gear around which is moved at least two satellite gears attached to the power axis, in which each one of the gears supports axes distant from the centers which are articulated by means of connecting rods that transmit movement to the arms of the rotors **characterized by** the fact that the sat-

elliptical gears have the same number of teeth as the fixed solar gear and the rotor arms are articulated with them by means of geared reduction to the number of displacers that supports each rotor, being from two to one when the rotor support two displacers each, from three to one when the rotors support three displacers each and so on. 5

6. System in accordance with the previous claim **characterized by** the fact that the geometric axis of the planetary mechanism of speed may be spaced from the geometric axis of the engine, placing at least one of them on a track or sliding axis, moved by a spindle, a hydraulic piston or a geared system, driven manually or by an engine, controlled by a computerized system. 10 15
7. System in accordance with claim 1 and 4 **characterized by** the fact that it can be constructed with a double crankshaft supporting two gears joined by a chain. Axes spaced from the center of the gears are articulated with arms of the rotors by means of rotary rods that transmit movement. 20
8. System in accordance with the previous claim **characterized by** the fact that the solar gear can displace angularly so as to modify the relative position of satellite gears with respect to the solar ones and thus modify on the relative position of the rotor and its displacers in relation to the admission and exhaust ports, and the ignition points of the chamber. 25 30
9. System in accordance with all the previous claims **characterized by** the fact that chambers, displacers and rotors can have sizes and geometric shapes very much varied, with or without sealing segments 35
10. System in accordance with all the previous claims **characterized by** the fact that it can operate with a turbine that increases the flow of inlet air, thereby increasing the volumetric capacity. 40
11. System in accordance with all the previous claims **characterized by** the fact that this system can be applied wholly or partially for the construction of different types of compressors and engines whether pneumatic internal combustion, moved by the pressure of various fluids, heated prior to or during the operation, with use of a variety of fluid or fuel, injection and/or ascended systems. 45 50

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Figure 1 - a

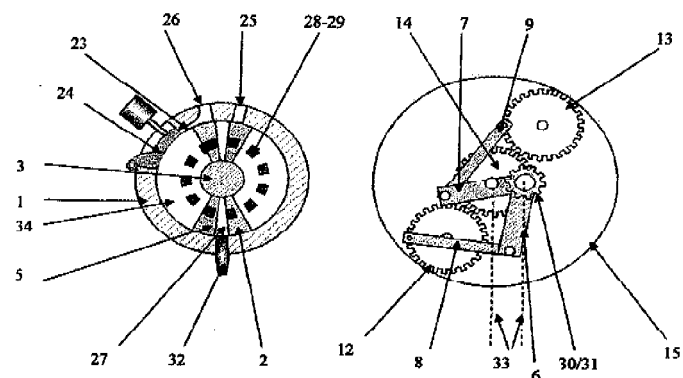


Figure 1 - b

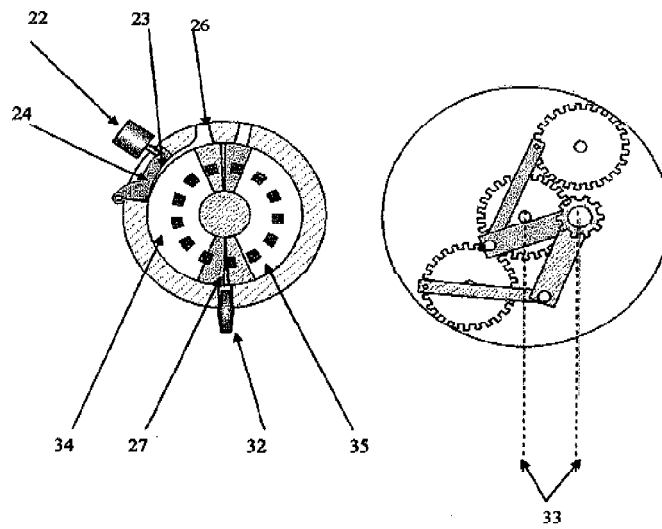


Figure 2,

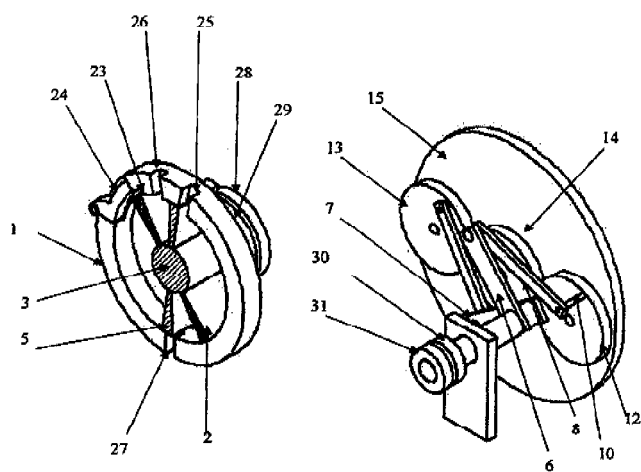


Figure 3

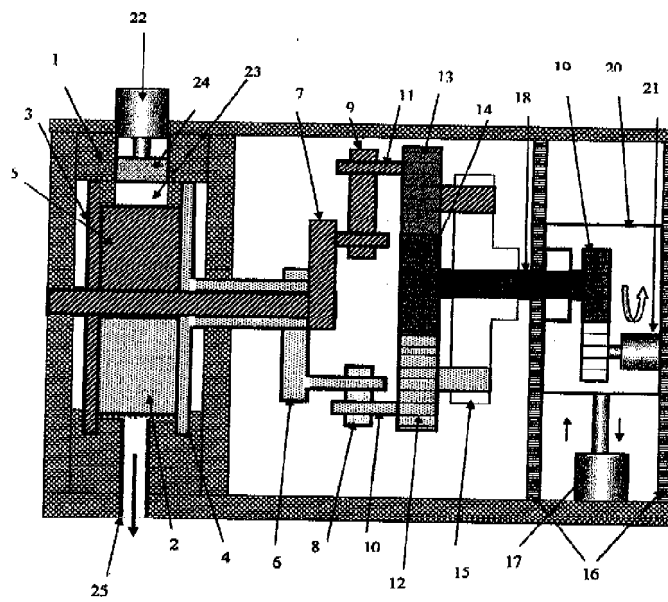


Figure 4 - a

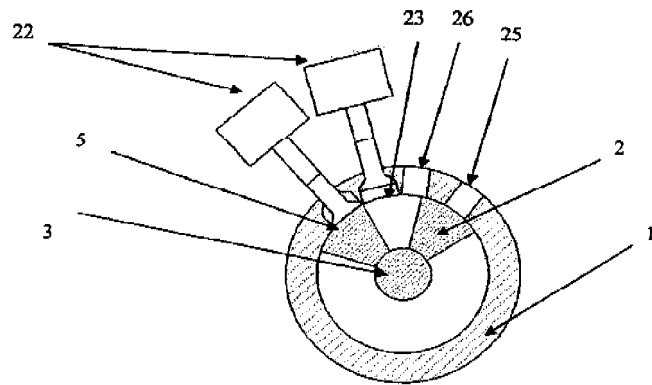


Figure 4 - b

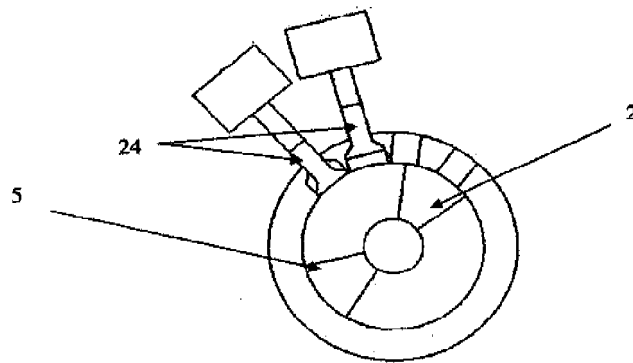


Figure 4 - c

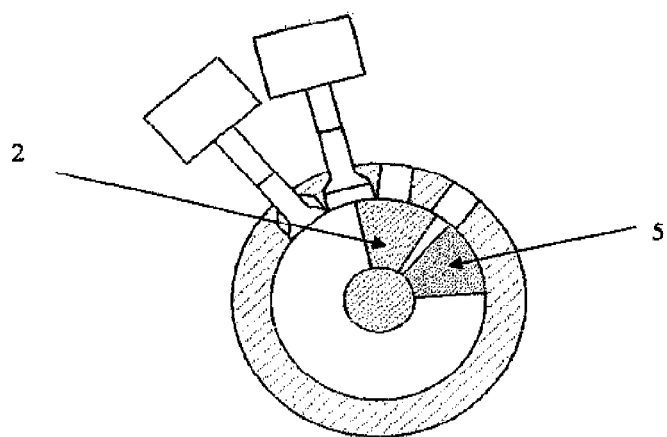


Figure 4 - b

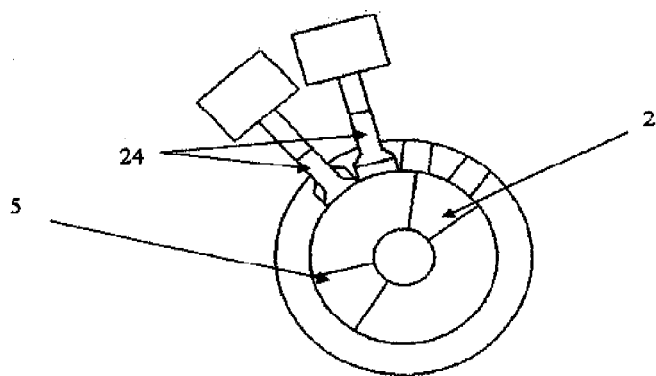
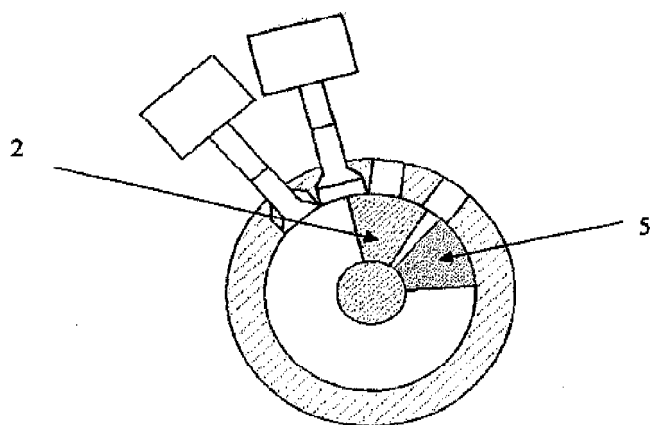


Figure 4 - c



INTERNATIONAL SEARCH REPORT

International application No.

PCT/BR2010/000324

A. CLASSIFICATION OF SUBJECT MATTER		
IPC (2010.01) F04C 18/00, F01B 25/02 According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols)		
IPC (2010.01) F04C, F01B		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
ESPACENET, EPOQUE		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	BR 9904603 A (HUGO JULIO KOPELOWICZ [BR]) 06 March 2001 (2001-03-06)	1
A	BR 0103272 A (KOPELOWICZ HUGO JULIO [BR]) 29 July 2003 (2003-07-29)	1
A	BR 9804379 A (HUGO JULIO KOPELOWICZ [BR]) 06 June 2000 (2000-06-06)	1
P, X	BR PI0801127 A2 (KOPELOWICZ HUGO JULIO [BR]) 29 December 2009 (2009-12-29)	1-11
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search		Date of mailing of the international search report
25 October 2010 (25.10.10)		10 december 2010 (10.12.10)
Name and mailing address of the ISA/ 		Authorized officer
Facsimile No.		Telephone No.

EP 2 484 908 A1

INTERNATIONAL SEARCH REPORT Information on patent family members

International application No.

PCT/BR2010/000324

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BR PI0801127 A2	2009-12-29	WO 2009129588 A1	2009-10-29
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Form PCT/ISA/210 (patent family annex) (July 2009)