(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
18 March 2010 (18.03.2010)

PCT

(10) International Publication Number
WO 2010/030254 A1

(51) International Patent Classification:
F02F 7/00 (2006.01)

(21) International Application Number:
PCT/TR2009/000039

(22) International Filing Date:
19 March 2009 (19.03.2009)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2008/06979 15 September 2008 (15.09.2008) TR

(72) Inventor; and

(71) Applicant : **OZDAMAR, Hasan Basri** [TR/TR]; Organize Sanayi Bolgesi 14. cadde, No:19, 38070 Kayseri (TR).

(74) Agent: **BERKKAM, Ayfer**; (BERKKAM PATENT DANISMANLIK LTD.STI.), Dikmen Cad . No : 420/22, Dikmen, 06450 ANKARA (TR).

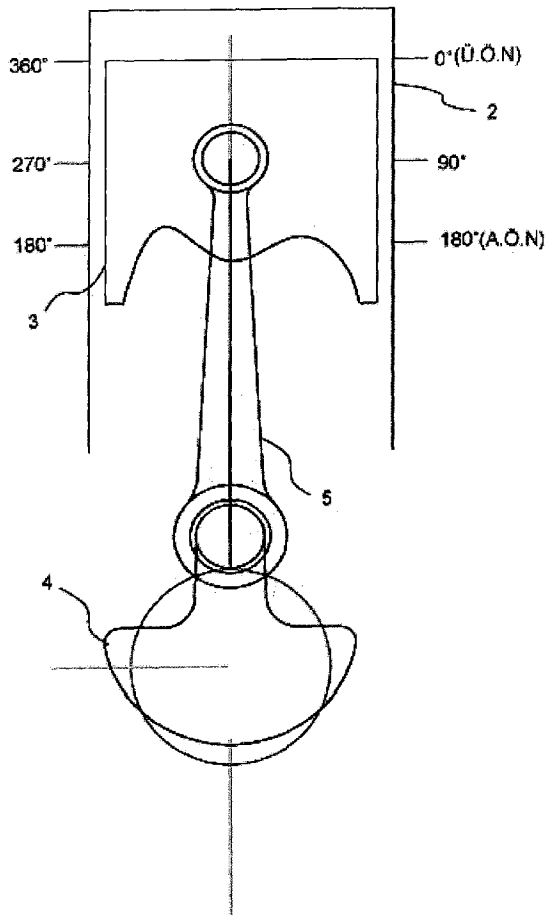
(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG,

[Continued on next page]

(54) Title: H.B.O. ENGINE

(57) Abstract: This invention is related to environment friendly and high - speed explosive and internal combustion engines which have the release of waste gas at minimum level wherein the fuel is used with maximum efficiency by the development of crank - connecting rod mechanism.

Figure 1



WO 2010/030254 A1

SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) **Designated States** *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

DESCRIPTION

H.B.O. ENGINE

Field of the Invention

The present invention is related to the environment friendly, explosive and internal combustion engines where the fuel is used with utmost efficiency by the development of the crank- rod mechanism and the release of exhaust waste is at minimum level.

Prior Art

In the known technique of the invention, since the invention of the internal combustion and explosive engines by Otto, studies were performed on the internal combustion and explosive engines by which it is aimed to achieve high engine power and fuel saving by improving the crankshaft, connecting road and piston mechanism.

In the Patent Application No US5186127, it is disclosed an internal combustion engine having an off-set crankshaft disposed at a predetermined distance sideward from the vertical axis of the cylinder counter to the direction of rotation of said crankshaft with an aim to obtain high performance and torque.

In the International Patent Application No WO9925968, an internal engine is described having an offset crankshaft-connecting rod mechanism from the central axis of the cylinder and aiming at increasing the efficiency factor of the engine.

The main problem encountered in the existing Otto engines and other traditional engines in the oldest known technique is that the efficiency of the engine is quite low due to the transfer of the pressure yielded by the fuel exploded or combusted in the engine to the crankshaft by means of unfavorable method. While the piston is at the top dead point in the mentioned engines, the pressure is at maximum level but the moment arm is at zero to rotate the crank. When the crank continues to rotate and the piston moves from the top dead point towards the bottom dead point, the cylinder volume expands by 0° – 90°; moment arm is slowly formed; and meanwhile the gas pressure rapidly decreases due to the equation of $P.V=P_1.V_1$. As a result, the duration of combustion which allows effective pressure and acts as a determinant factor of productivity is limited to a short time framework. As for the relationship between the gas pressure x moment arm, since the pressure decreases despite the increase of the moment arm, maximum level of rotation moment could not achieved and requested combustion output could not be reached (Figure 1).

In the above mentioned United States and International Patent applications and in the known technique, a small moment arm is formed to rotate the crank shaft while the piston is at the top dead point due to its off-set position in the engines having an off-set crank-rod arm mechanism disposed at a predetermined distance from the axis of the cylinder in order to increase the performance. However, high pressure created during when the piston is positioned at the top dead point quickly falls down due to the short period of combustion and expansion of the volume. Rotation moment could not reach the requested effective values and full combustion could not be realized due to the rapid decrease of the gas pressure despite the expansion of the moment arm based on the equation of rotation moment = gas pressure x moment arm. An impact to exceed the traditional engines would not be created in these mentioned applications.

Brief Description of the Invention

The purpose of this invention is to develop a high power, high torque and high speed engine having a large moment arm in high pressure and ensuring full and effective combustion wherein the direction of the force affecting the crank shaft was shifted by giving a special form to the connecting rod due to the off-set position of the crank rotation axis disposed at a predetermined distance from the central axis of the cylinder.

Another purpose of the invention is to develop an environment- friendly engine wherein the fuel is fully combusted with in the time framework allocated for combustion and thus the release of waste gas from the exhaust is at minimum level.

Another purpose of the invention is to develop an engine at relatively lower cost that allows obtaining higher power in smaller cylinder volumes by saving high amount of fuel.

Another purpose of the invention is to develop a high power, high torque and high speed engine which allows fuel saving and adjustment of the piston speed at different points in the stroke and thereby making beneficial adjustments on the ignition and injection time, opening and closing time of inlet and exhaust valves.

Detailed Description of the Invention

The description of the figures which are prepared in order to better explain the engine, which has been developed with this invention, are given below:

Figure 1 – Front schematic view of the cylinder system of a traditional engine in the known technique, when the piston is at the top dead point.

Figure 2 – Schematic view of the position of the piston in the cylinder system of the engine that is the subject of the invention, when the angle of the crank is at 0°.

Figure 3 - Schematic view of the position of the piston in the cylinder system of the engine that is the subject of the invention, when it is at the top dead point.

Figure 4 – Schematic view of the position of the piston in the cylinder system of the engine that is the subject of the invention, when the angle of the crank is at 90°.

Figure 5 - Schematic view of the position of the piston in the cylinder system of the engine that is the subject of the invention, when the angle of the crank is at 180°.

Figure 6 - Schematic view of the position of the piston in the cylinder system of the engine that is the subject of the invention, when it is at the bottom dead point.

Figure 7 - Schematic view of the position of the piston in the cylinder system of the engine that is the subject of the invention, when the angle of the crank is at 270°.

Figure 8 - Schematic view of the position of the piston in the cylinder system of the engine that is the subject of the invention, when the angle of the crank is at 360°.

Figure 9 - Schematic view of the position of the piston in the cylinder system of the engine in a preferred embodiment of the invention, when the angle of the crank is at 0°.

The description of the parts which are covered in the figures are separately numbered and given below.

1- Engine

2- Cylinder

3- Piston

4- Crank

5- Connecting rod

The engine (1) that is the subject of the invention is comprised by at least one cylinder (2), at least one piston (3) moving inside the cylinder, at least one crank (4) that is effective in the adjustment of the piston (3) speed by drawing away its rotation axis from the cylinder (2) axis at a predetermined angle, at least one connecting rod (5) that connects at least one

crank (4) to the piston (3) and shaped in a way to allow to shift the direction of the force received over the crank (4) rotation center.

Rotation axis of the crank (4) that is attached to the connecting rod (5) by means of the special form given to the connecting rod in the engine (1) that is the subject of the invention is shifted from the axis of the cylinder (2) at x distance and simultaneously the direction of the force put on the rotation center of the crank (4) is shifted. The rotation center of the crank (4) is drawn away from the center of the cylinder (2) at a predetermined distance and the duration of induction, squeezing, combustion and exhaust period is arranged in a requested way by leading to the increase in the efficiency of the engine (1).

In the traditional engines, when the piston (3) is at the top dead point, the moment arm on the crank (4) is zero; and while the angle of the crank approaches to 90°, the volume of the piston (3) quickly expands and accordingly cylinder (2) pressure rapidly decreases. The moment arm created on the crank (4) increases in size with the approach; on the other hand an effective rotation moment could not be acquired based on the equation of rotation moment = moment arm x cylinder pressure (Figure 1).

In the engine (1) that is the subject of the invention, the direction of the force is shifted by shape of the connecting rod (5) that is on the rotation center of the crank (4) when the angle of the crank is 0° or during the combustion period; an effective moment arm is created on the crank (4) due to the off-set position of the rotation center of the crank (4) from the axis of the cylinder (2) at x distance; and the crank (4) has an angle up to x° when the piston (3) reaches at the top dead point. When the angle of the crank (4) is between x° - 90°, piston (3) speed decreases and the piston (3) very slowly moves inside the cylinder (2); and thus the pressure on the piston (3) is kept at high level for a long time. The distance made by the piston (3) is lower than half of the stroke, and therefore full and efficient combustion is realized by allocating sufficient amount of time to the combustion (Figure 2, Figure 3, Figure 4).

The piston (3) further proceeds when the angle of the crank shifts between 90° - 180°; such further than the distance made when the angle of the crank is between 0° - 90° and reaches at the bottom dead point when the angle of the crank is 180° + x°. This leads to the increase of the thermodynamic efficiency and achievement of higher amount of power, torque and speed in comparison with the traditional engines as the fuel is used more efficiently with the less progress of the piston between x° - 90° compared to the movement of the crankshaft (4) (Figure 5, Figure 6).

While the angle of the crank is between 180° - 270°, the piston (3) makes less progress than half of the stroke and the said distance is less than the distance made at the same interval of angle in the traditional engines. When it is between 270° - 360°, the piston (3) proceeds further than half of the stroke and the exhaust time is completed (Figure 7, Figure 8). Thus, induction period and opening / closing time of the exhaust valves could be arranged towards increasing the engine speed, power and torque in line with the speed of the piston (3).

In a preferred embodiment of the engine (1) that is the subject of the invention, the axis of the cylinder (2) is positioned off-set from the crank rotation axis at a predetermined distance and it has an angle that is equivalent of μ with the cylinder (2) axis. When the piston (3) is at the top dead point, the connecting rod (5) has Θ angle with the cylinder axis. As the crank (4) shaft rotates; the angle of Θ decreases and continues to decrease according to the position of the crank (4) shaft and the piston (3) axis; or becomes equal to zero; and makes an angle like Δ on the other part. Due to the decrease of the angle of Θ in the said engines (1), the piston moves slower than the traditional engines allocating sufficient amount of time for combustion. In addition, high moment arm is obtained by rotating the crank (4) by means of shifting the direction of the force affecting the crank (4) with the slow motion of the piston (3) thanks to the special form given to the connecting rod (5). Hence, it is possible to achieve such high moment that would rotate the crank on the basis of the equation of rotation moment = gas pressure x moment arm.

Before the piston (3) reaches at the top dead point, the moment arm and the crank (4) is affected in the direction of rotation prior to the top dead point. The crank (4) shaft approaches to the bottom dead point at an angle of $180 + a_2$ and the completion of the work takes place in a duration of $180 + a_1 + a_2$. This would result in the increase of time provided for combustion due to the low speed of the piston (3); and high amount of fuel could be saved by obtaining the required power with less amount of fuel.

It is possible to develop various embodiments within the framework of the mentioned basic principles. The engine (1) that is the subject of the invention could not be limited with the examples provided in the description of the invention. The invention is basically according to its claims.

CLAIMS

1. An engine (1) that is characterized with at least one cylinder (2), at least one piston (3) moving inside the cylinder, at least one crank (4) that is effective in the adjustment of the piston (3) speed by drawing away its rotation axis from the cylinder (2) axis at a predetermined distance (x), at least one connecting rod (5) that connects at least one crank (4) to the piston (3) and shaped in a way to allow to shift the direction of the force received over the crank (4) rotation center.

2. An engine according to the Claim 1 characterized in that it is comprised by at least one connecting rod (5) having a special form that allows shifting the direction of the force created on the rotation center of the crank (4) during the explosion or combustion period when the angle of the crank (4) is 0°; and adjustment of the piston (3) speed as requested.

3. An engine (1) according to the Claim 1 and Claim 2 characterized in that it is comprised by at least one crank (4) which has a rotation axis shifted from the cylinder (2) axis at x distance and allows the adjustment of the induction, squeezing, combustion and exhaust periods in a way to increase the efficiency.

4. An engine (1) according to any of the preceding claims characterized in that it is comprised by at least one crank (4) that creates an effective moment arm on its top due to the off-set position of the rotation center from the axis of the cylinder (2) at x distance; and has an angle up to x° when the piston (3) reaches at the top dead point.

5. An engine (1) according to any of the preceding claims characterized in that it is comprised by at least one crank (4) that allows the decrease of the piston (3) speed and the realization of the full combustion, when its angle with the cylinder (2) axis is between x° - 90°.

6. An engine (1) according to any of the preceding claims characterized in that it is comprised by at least one crank (4) that allows the piston (3) to proceed further than half of the stroke when its angle shifts between 90° - 180°; and reaches at the bottom dead point when its angle with the cylinder (2) is 180° + x°.

7. An engine (1) according to any of the preceding claims characterized in that it is comprised by at least one crank (4) that allows the piston (3) to make less progress than half of the stroke and adjustment of induction period and opening / closing time of the exhaust valves towards increasing the engine speed, power and torque in line with the speed of the piston (3), when its angle with the cylinder (2) is between 180° - 270°.

8. An engine (1) according to any of the preceding claims characterized in that it is comprised by a cylinder (2) that is positioned off-set from the crank (4) rotation axis at a predetermined distance and has an angle of μ with the cylinder (2) axis.

Figure 1

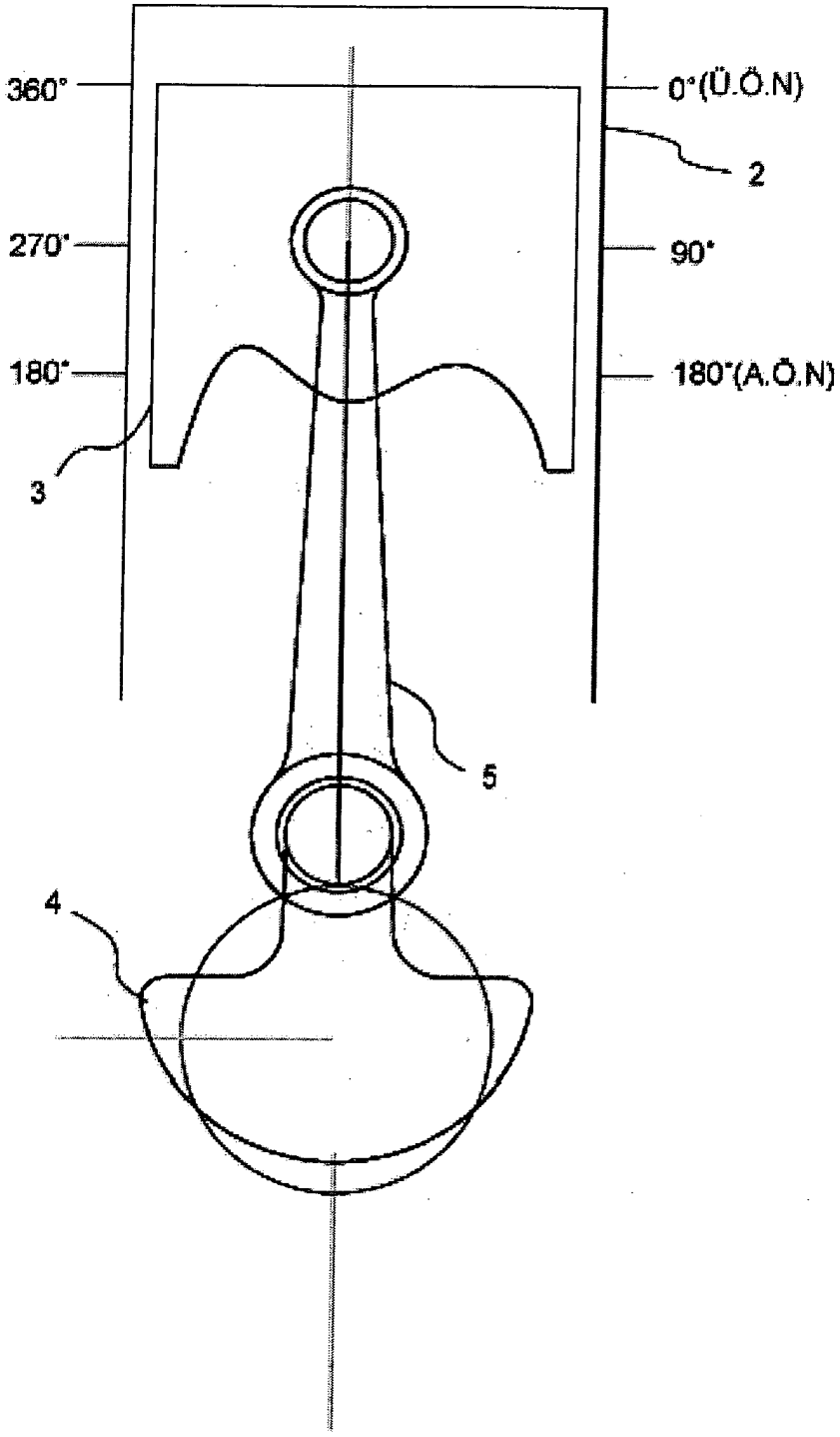


Figure 2

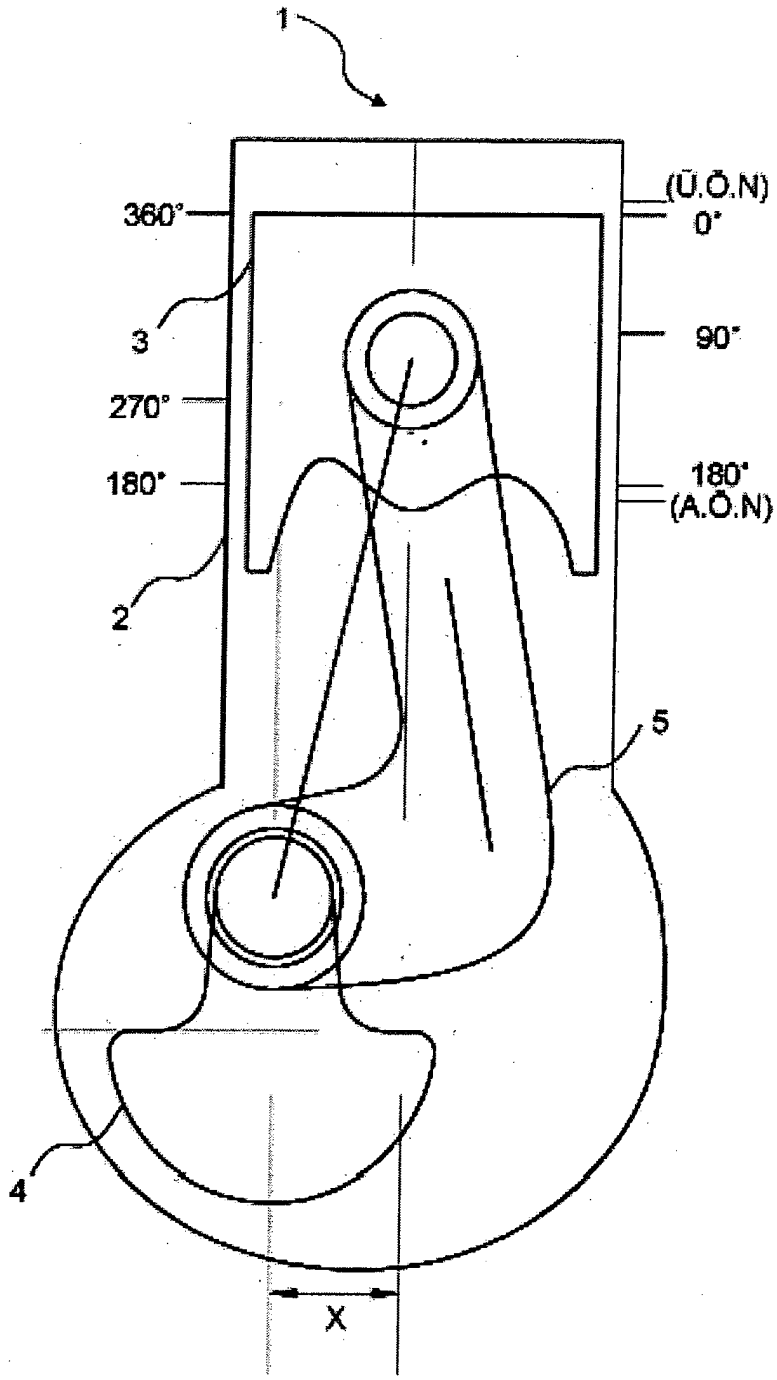


Figure 5

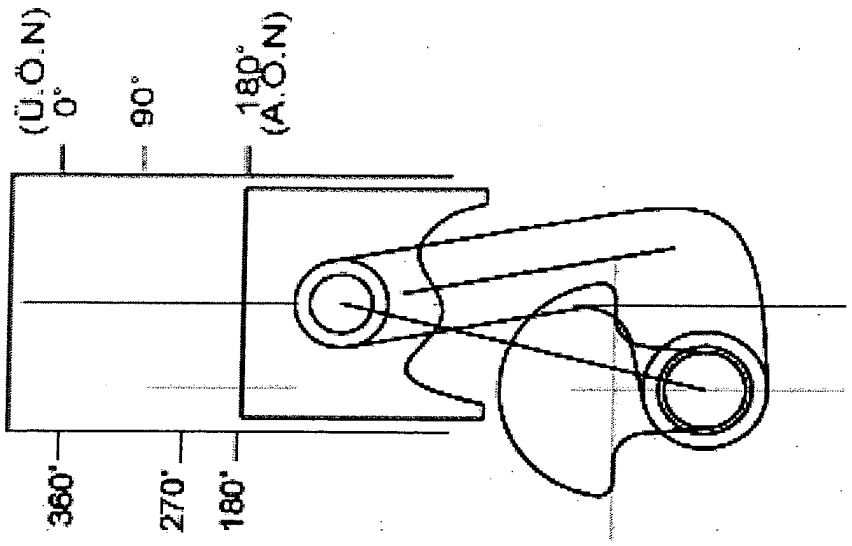
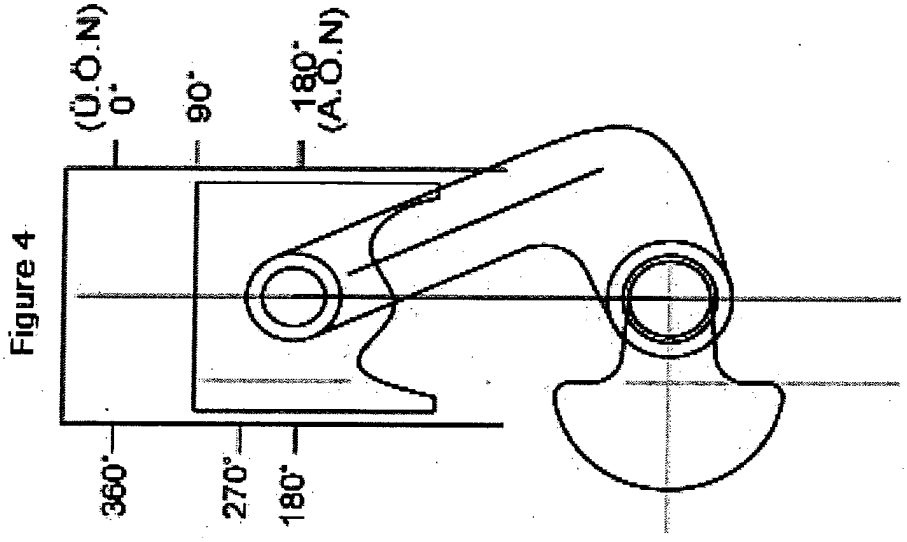


Figure 4



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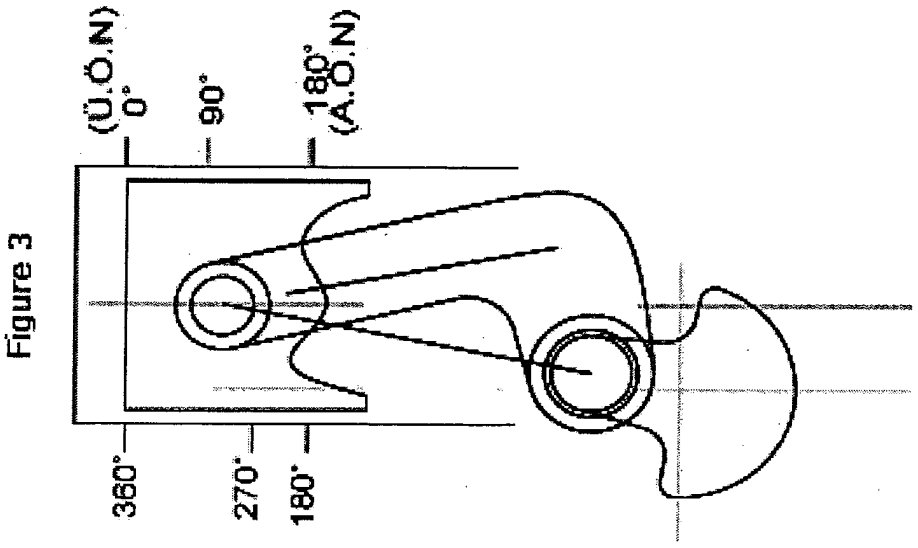


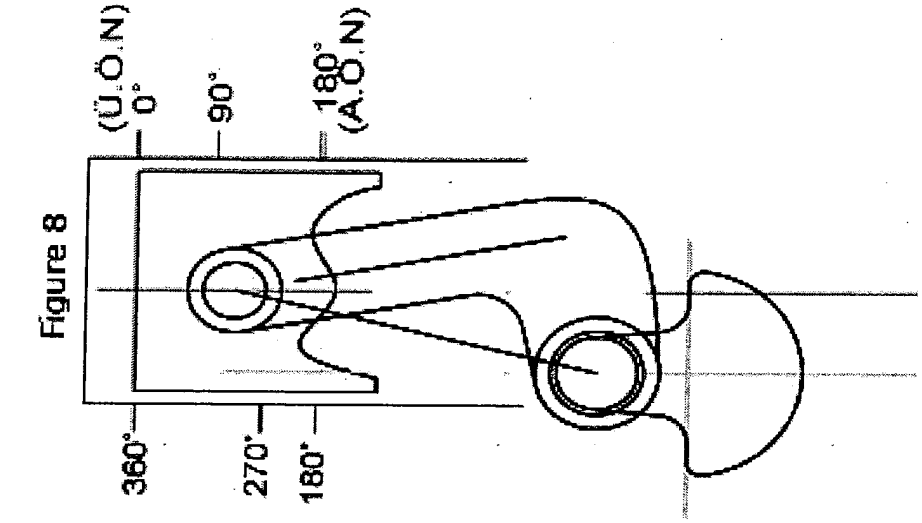


Figure 8

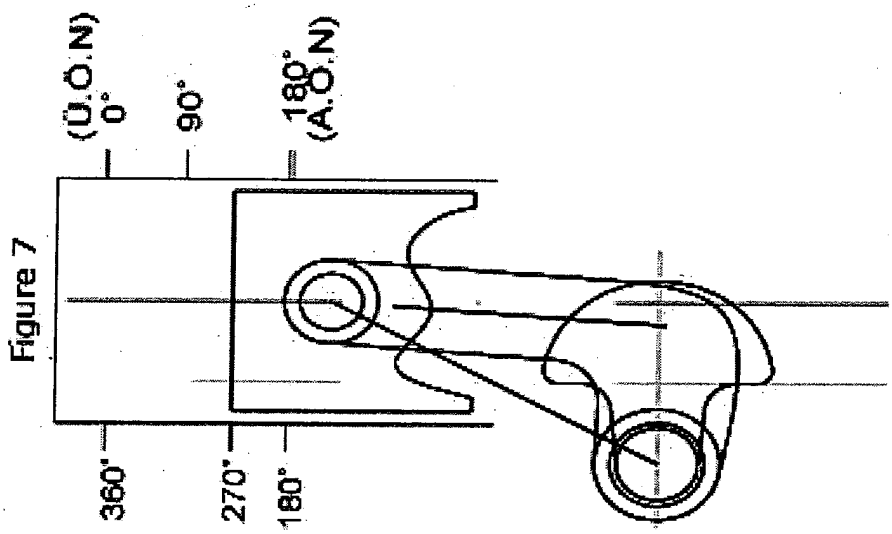


Figure 7

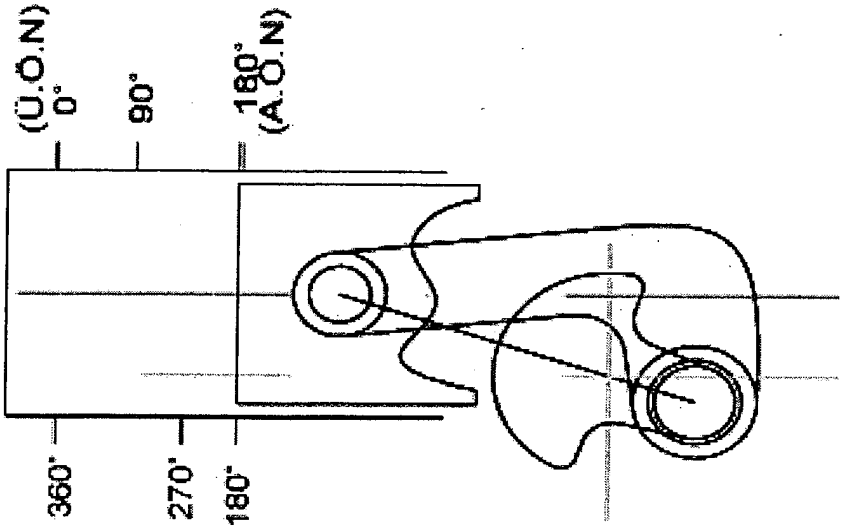
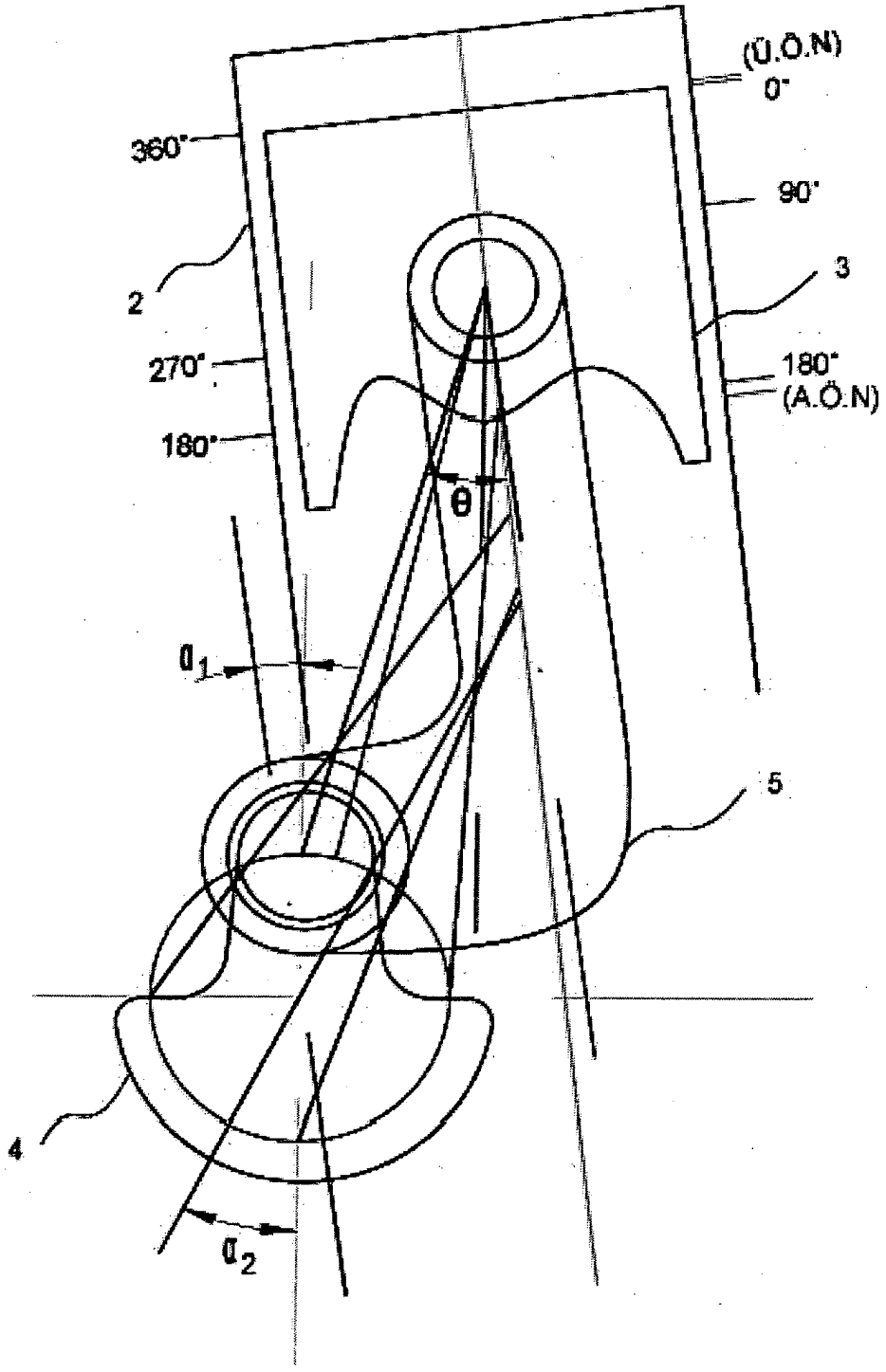


Figure 6

Figure 9



INTERNATIONAL SEARCH REPORT

International application No
PCT/TR2009/000039

A. CLASSIFICATION OF SUBJECT MATTER
INV. F02F7/00

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)
F02F

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 practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 95/30826 A1 (CHO SANG YEON [KR]) 16 November 1995 (1995-11-16) figure 4	1-8
X	CN 1 363 766 A (YING HUA [CN]) 14 August 2002 (2002-08-14) figures 1-7	1-8
X	US 7 021 270 B1 (STANCZYK DAN [US]) 4 April 2006 (2006-04-04) figures 1-6	1-8
X	KR 2003 0033528 A (CHA GIL UP [KR]) 1 May 2003 (2003-05-01) figures 1-10	1-8

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
24 July 2009	03/08/2009

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Matray, J

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INTERNATIONAL SEARCH REPORT

International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT

Information on patent family members

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