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(54) **Crank mechanism of the internal combustion piston engine with variable crankthrow.**

(57) The invention solves the problem of continuous current changing the compression ratio within a wide range with simultaneous changing the engine capacity.

The essence of the invention consists in that the crank mechanism comprises an eccentric sleeve (*4*) being an intermediate element between the connecting-rod journal (*5*) of the crankshaft (*6*) and the big end of the connecting-rod (*2*). The axis of the internal hole of the sleeve (*4*) is moved in relation to the axis of the external cylindrical surface of the sleeve (*4*) by the eccentric size (*e*) bigger from zero and smaller or equal to 30% of the crankthrow (*R*) of the crankshaft. The eccentric sleeve (*4*) is connected with a driving gear ensuring the angular velocity ($\omega m$) of the sleeve (*4*) in relation to the connecting-rod journal (*5*) of the crankshaft (*6*) within the range of $\pm$ 1/2$\omega$ up to $\pm\omega$, where ($\omega$) is the angular velocity of the crankshaft (*6*).

The crank mechanism is provided also with a control mechanism (*10*) of the angular position of the sleeve (*4*) by a definite angle ($\alpha$ *o*) in relation to the crankthrow (*R*) of the crankshaft (*6*), determined at such a position of the crankthrow (*R*) in which the piston (*1*) is most distant from the crankshaft.

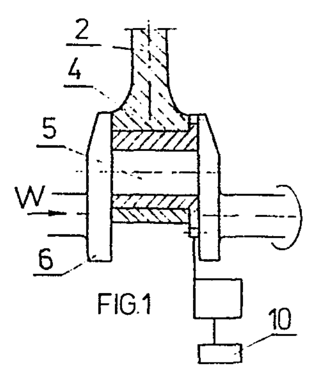


FIG.1

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# Crank mechanism of the internal combustion piston engine with variable crankthrow.

The subject of the present invention is a crank mechanism of the internal combustion piston engine with variable crankthrow.

Those skilled in the art know from the publication "The variable stroke engine - its problems and promises" by D.C.Siegla, Robert M.Siewert, SAE Paper 780700, 1978, a Pouliot variable stroke engine which comprises a connecting-rod, a crankshaft and an additional connecting-rod with a connector. The additional connecting-rod, with its protrusion distant from the axis of the crankshaft, couples the connecting-rod and the connector, the other end of which is connected with a stroke adjusting screw and is guided by a guiding rod.

Such an engine has a complex mechanism with a considerably lowered mechanical efficiency and considerable times of the stroke change. Besides, crank mechanisms with many additional parts are considerably mechanically loaded and, consequently, big and heavy.

The object of the present invention is to achieve the possibility of current continuous adjustment of the compression ratio in the IC piston engine. The task to be solved is the designing of a crank mechanism with a variable crankthrow. The crank mechanism according to the invention, provided with a piston connected with the connecting-rod by means of a piston pin, and a crankshaft, is distinguished by that it incorporates an eccentric sleeve being an intermediate element between the connecting-rod journal of the crankshaft and the connecting-rod big end. The axis of the internal hole of the sleeve is moved away in relation to the axis of the external cylindrical surface of the sleeve by the eccentric size bigger from zero and smaller or equal to 30% of the crankthrow of the crankshaft.

The eccentric sleeve is connected also with a driving gear providing for the angular velocity of the eccentric sleeve, in relation to the connecting-rod journal, of the value of the sleeve angular velocity in the range of plus, minus half the crankshaft angular velocity up to plus, minus the crankshaft angular velocity. The crank mechanism is, moreover, provided with a mechanism controlling the eccentric sleeve angular position by a definite angle in relation to the crankthrow of the crankshaft, determined at such a crankthrow position in which the piston is most distant from the crankshaft.

The first driving gear consists of the first pair of external gear wheels, the first gear wheel being coupled with the crankshaft through the intermediary of a set of gear wheels.

The second driving gear consists of the first and the second pair of external gear wheels, the first wheel of the first pair being coupled with the eccentric sleeve and the second wheel of the first pair being coupled with the crankshaft. The second gear wheel of the first pair and the first gear wheel of the second pair are mounted on a common shaft bearing-mounted in the crankshaft arm.

The third driving gear consists of a pair of gear wheels, the first gear wheel, of external gear, being coupled with the eccentric sleeve, and the second gear wheel, of internal gear, being coupled with the crankshaft.

The fourth driving gear consists of the first pair of external gear wheels and the second pair of gear wheels. The first wheel of the first pair is coupled with the eccentric sleeve. and the second wheel of the second pair of internal gear is coupled with the crankshaft.

According to the invention, the possibility of current continuous changing the compression ratio within a wide range has been achieved, with a simultaneous change of the engine capacity. Besides, due to the application of the crank mechanism according to the invention and the first, the second and the third crank mechanism the possibility of continuous changing the engine thermodynamic working cycle has been achieved, what improves parameters of such a piston engine. A simple design and easy control do not present any design problems and enable applying it in any piston engines.

The subject of the invention is presented in an example of its realisation in the drawing in which fig.1 presents the longitudinal section of the crankshaft inside crank, fig.2 - the cross-section in the "W" view of the crankshaft inside crank, fig.3 - the kinematic diagram of the crank mechanism, fig.4 - the kinematic diagram of the driving mechanism of the eccentric in the side view, fig.5 - the kinematic diagram of the driving mechanism of the eccentric along the axis of the crankshaft, fig.6 - the kinematic diagram of the driving mechanism of the eccentric of the second crank mechanism in the side view, fig.7 - the kinematic diagram of the driving mechanism of the eccentric of the second crank mechanism along the axis of the crankshaft, fig.8 - the kinematic diagram of the driving mechanism of the eccentric of the third crank mechanism in the side view, fig.9 - the kinematic diagram of the driving mechanism of the eccentric of the third crank mechanism along the axis of the crankshaft, fig.10 - the kinematic diagram of the driving mechanism of the eccentric of the fourth crank mechanism in the side view, fig.11 - the kinematic diagram of the driving mechanism of the eccentric of the fourth crank mechanism along the axis of the crankshaft, fig.12 - the kinematic diagram of the crank mechanism, fig.13 - the kinematic diagram of perticuler phases of the four-stroke engine (for $\omega_m = \pm 1/2\omega$ ), fig.14 - the kinematic diagram of perticular phases of the engine for $\omega_m = \pm\omega$ , and fig.15 - the kinematic diagram of the fifth, sixth, seventh, eighth mechanism.

Example of realisation I. The crank mechanism shown in figs 1, 2, 3 of the drawing comprises a piston 1 connected with the connecting-rod 2 by means of a piston pin 3. Besides, it comprises an eccentric sleeve 4 being an intermediate element between a connecting-rod journal 5 of the crankshaft 6 and the big end of the connecting-rod 2.

The axis of the internal hole of the sleeve 4 is moved in relation to the axis of the external cylindrical surface of the sleeve 4 by the size of the eccentric e equal to 6% of the crankthrow R of the crankshaft 6.

The eccentric sleeve 4 is connected with the driving gear ensuring the angular velocity $\omega_m$ of the sleeve 4 in relation to the connecting-rod journal 5 of the value $\omega_m = 157\ s^{-1}$, the angular velocity of the crankshaft 6 being equal to 314 $s^{-1}$.

The driving gear shown in fig.4 and fig.5 of the drawing consists of a pair of external gear wheels 7 and 8, the gear wheel 7 being coupled with the eccentric sleeve 4, and the gear wheel 8 being coupled with the crankshaft 6 through the intermediary of a set of gear wheels 9.

The control mechanism 10 of the angular position of the eccentric sleeve 4, as shown in fig.6 of the drawing, causes a definite position of the axis 11 of the sleeve 4, expressed by the angle $\alpha_0 = 0^o$, in relation to the crankthrow R of the crankshaft 6, determined at such position of the crankthrow R in which the piston 1 is most distant from the crankshaft 6.

The mechanism operates in the below-described way. During rotation of the crankshaft 6 the driving gear of the sleeve 4 makes the sleeve 4 spin around the connecting-rod journal 5 with the angular velocity $\omega_m = 157\ s^{-1}$, that is, with the angular velocity twice lower from the spinning velocity of the crankshaft 6, the sleeve 4 spinning in the direction compatible with the spinning direction of the crankshaft 6.

Subsequent positions of the crank mechanism are shown in fig.7 of the drawing. At the angle of rotation of the crankshaft 6 equal to $0^o$ the crankthrow R, the eccentric axis e and the connecting-rod 2 are set in one line. When the crankshaft 6 turns by the angle of $180^o$, the crankthrow R is directed downwards, whereas the eccentric axis e is turned in relation to the connecting-rod journal 5 by the angle of $90^o$. During that time the piston 1 performed the stroke S1. At the angle of rotation of the crankshaft 6 by $360^o$, the crankthrow R is directed upwards, whereas the eccentric axis e turned in relation to the connecting-rod journal

5 by the angle of 180°. During that time the piston 1 performed the stroke S2, shorter from the stroke S1. On the other hand, at rotation of the crankshaft 6 by the angle of 540°, the piston 1 performs again the stroke S2. After rotation of the crankshaft 6 by the angle of 720° the engine working cycle is finished, whereby the elements of the crank mechanism take up such a position as at the 0° angle of rotation of the crankshaft 6.

The crankthrow R spins in the direction marked with the full-line arrow, and the sleeve 4 spins in relation to the connecting-rod journal 5 in the direction marked with the full-line arrow.

In the case if the angular velocity $\omega_m$ = 157 $s^{-1}$, operation of the crank mechanism is similar, whereby the eccentric sleeve 4 spins in relation to the connecting-rod journal 5 in the direction opposite to the direction of the crankshaft 6, as shown with the broken line in fig.7 of the drawing.

Example of realisation II. The crank mechanism shown in fig.1, fig.2 and fig.3 of the drawing comprises a piston 1 connected with a connecting--rod 2 by means of a piston pin 3. Besides, it comprises an eccentric sleeve 4, being an intermediate element between the connecting-rod journal 5 of the crankshaft 6 and the big end of the connecting-rod 2.

The axis of the internal hole of the sleeve 4 is moved in relation to the axis of the external cylindrical surface of the sleeve 4 by the eccentric size 3 equal to 7% of the crankthrow R of the crankshaft 6.

The eccentric sleeve 4 is connected with the driving gear ensuring the angular velocity $\omega_m$ of the sleeve 4 in relation to the connecting-rod journal 5 of the value $\omega_m = 400\ s^{-1}$, the angular velocity of the crankshaft 6 being equal to 400 $s^{-1}$.

The driving gear shown in fig.8 and fig.9 of the drawing consists of two pairs of external gear wheels 12,13 and 14,15, the gear wheel 12 being coupled with the eccentric sleeve 4, and the gear wheel 15 being coupled with the crankshaft 6 through the intermediary of a set of gear wheels 9. Gear wheels 13 and 14 are mounted on a common shaft 16 bearing-mounted in the arm of the crankshaft 6.

The control mechanism 10 of the angular position of the eccentric sleeve 4, as shown in fig.6 of the drawing, causes a definite position of the axis 11 of the sleeve 4, expressed by the angle $\alpha_o = 90^\circ$, in relation to the crankthrow R of the crankshaft 6, determined at such a position of the crankthrow R in which the piston 1 is most distant from the crankshaft 6.

The second crank mechanism operates in the below-described way. During rotation of the crankshaft 6 the driving gear of the sleeve 4 makes the sleeve 4 spin round the connecting-rod journal 5 with the angular velocity $\omega_m = 400\ s^{-1}$, that is, with the angular velocity equal to the spinning velocity of the crankshaft 6, the sleeve 4 spinning in the direction compatible with the spinning direction of the crankshaft 6.

Subsequent positions of the crank mechanism are shown in fig.10 of the drawing. At the angle of rotation of the crankshaft 6 equal to $0^o$ the crankthrow R is directed upwards, whereas the eccentric axis e is turned in relation to the connecting-rod journal 5 by the angle of $90^o$. When the crankshaft 6 is turned by the angle of $180^o$, the crankthrow R is directed downwards, whereas the eccentric axis e is turned in relation to the connecting-rod journal 5 by the angle of $90^o$. During that time the piston 1 performs the stroke S. At the angle of rotation of the crankshaft 6 by $360^o$ the crankthrow R is directed upwards, whereas the eccentric axis e has performed rotation in relation to the connecting-rod journal also by the angle of $360^o$. During that time the piston 1 has also performed the stroke S. Rotation of the crankshaft by every further $360^o$ causes repetition of the above described working cycle during which the piston 1 performs further two strokes S.

The crankthrow R spins in the direction marked with the full-line arrow, and the sleeve 4 spins in relation to the connecting-rod journal 5 in the direction marked with the full-line arrow.

In the case if the angular velocity $\omega_m = -400\ s^{-1}$, operation of the crank mechanism is similar, whereby the eccentric sleeve 4 spins in relation to the connecting-rod journal 5 in the direction opposite to the direction of the crankshaft 6, as shown with the broken line in fig.10 of the drawing.

Example of realisation III. The crank mechanism shown in fig.1, fig.2 and fig.3 of the drawing comprises a piston 1 connected with a connecting-rod 2 by means of a piston pin 3. Besides, it comprises an eccentric sleeve 4 being an intermediate element between the connecting-rod journal 5 of the crankshaft 6 and the big end of the connecting-rod 2.

The axis of the internal hole of the sleeve 4 is moved in relation to the axis of the external cylindrical surface of the sleeve 4 by the eccentric size e equal to 5% of the crankthrow R of the crankshaft 6.

The eccentric sleeve 4 is connected with the driving gear ensuring the angular velocity $\omega m$ of the sleeve 4 in relation to the connecting-rod journal 5 of the value $\omega m = 300\ s^{-1}$, whereas the crankshaft 6 spins with the angular velocity $\omega = 300\ s^{-1}$.

The driving gear shown in fig.11 and fig.12 of the drawing consists of a pair of gear wheels 17 and 18, the gear wheel 17, of external gear, being coupled with the eccentric sleeve 4, and the gear wheel 18, of internal gear, being coupled with the crankshaft 6 through the intermediary of a set of gear wheels 19.

The control mechanism 10 of the angular position of the eccentric sleeve 4, as shown in fig.6 of the drawing, causes a definite position of the axis 11 of the sleeve 4, expressed by the angle $\alpha o = 91^{0}$, in relation to the crankthrow R of the crankshaft 6, determined at such a position of the crankthrow R in which the piston 1 is most distant from the crankshaft 6.

The third crank mechanism operates in the below-described way. During rotation of the crankshaft 6 the driving gear of the sleeve 4 makes the sleeve 4 spin around the connecting-rod journal 5 with the angular velocity $\omega m = 300\ s^{-1}$, that is, with the angular velocity equal to the spinning velocity of the crankshaft 6, the sleeve 4 spinning in the direction compatible with the spinning direction of the crankshaft 6.

Subsequent positions of the crank mechanism are shown in fig.10 of the drawing. At the angle of rotation of the crankshaft 6 equal to $0^{o}$ the crankthrow R is directed upwards, whereas the eccentric axis e is turned in relation to the connecting-rod journal 5 by the angle of $91^{o}$. At turning the crankshaft 6 by the angle of $180^{o}$ the crankthrow R is directed downwards, whereas the eccentric axis e is turned in relation to the connecting-rod journal 5 by the angle $91^{o}$. During that time the piston 1 has performed the stroke S. At the angle of rotation of the crankshaft 6 by the angle of $360^{o}$ the crankthrow R is directed upwards, whereas the eccentric axis e has turned in relation to the connecting-rod journal 5 also by the angle of $360^{o}$. During that time the piston 1 has also performed the stroke S. Rotation of the crankshaft by every further $360^{o}$ causes repetition of of the working cycle during which the piston 1 performs further two strokes S.

Example of realisation IV. The crank mechanism shown in fig.1, fig.2 and fig.3 comprises a piston 1 connected with a connecting-rod 2 by means of a piston pin 3. Besides, it comprises an eccentric sleeve 4 being an intermediate element between the connecting-rod journal 5 of the crankshaft 6 and the big end of the connecting-rod 2.

The axis of the internal hole of the sleeve 4 is moved in relation to the axis of the external cylindrical surface of the sleeve 4 by the eccentric size e equal to 5% of the crankthrow R of the crankshaft 6.

The eccentric sleeve 4 is connected with the driving gear ensuring the angular velocity $\omega m$ of the sleeve 4 in relation to the connecting-rod journal 5 of the value $\omega m = 160\ s^{-1}$, whereas the crankshaft 6 spins with the angular velocity $\omega = 160\ s^{-1}$.

The driving gear shown in fig.13 and fig.14 of the drawing consists of two pairs of gear wheels 19 and 20 and 21 and 22. Gear wheels 19 and 20 are external gears. The gear wheel 19 is coupled with the eccentric sleeve 4, and the gear wheel 22 is coupled with the crankshaft 6 through the intermediary of a set of gear wheels 23. Gear wheels 20 and 21 are mounted on a common shaft 24 bearing-mounted in the arm of the crankshaft 6.

The control mechanism 10 of the angular position of the eccentric sleeve 4, as shown in fig.6

of the drawing, causes a definite position of the axis 11 of the sleeve 4, expressed by the angle $\alpha o = 89^{o}$, in relation to the crankthrow R of the crankshaft 6, determined at such a position of the crankthrow R in which the piston 1 is most distant from the crankshaft 6.

The fourth crank mechanism operates in the below-described way. During rotation of the crankshaft 6 the driving gear of the sleeve 4 makes the sleeve 4 spin around the connecting-rod journal 5 with the angular velocity $\omega m = 160\ s^{-1}$, that is, with the angular velocity equal to the spinning velocity of the crankshaft 6, the sleeve 4 spinning in the direction compatible with the spinning direction of the crankshaft 6.

Subsequent positions of the crank mechanism are shown in fig.10 of the drawing. At the angle or rotation of the crankshaft 6 equal to $0^{o}$ the crankthrow R is directed upwards, whereas the eccentric axis e is turned in relation to the connecting-rod journal 5 by the angle of $89^{o}$. At turning the crankshaft 6 by the angle of $180^{o}$, the crankthrow R is directed downwards, whereas the eccentric axis e is turned in relation to the connecting-rod journal 5 by the angle of $89^{o}$. During that time the piston 1 has performed the stroke S. At the angle of rotation of the crankshaft 6 by $360^{o}$ the crankthrow R is directed upwards, whereas the eccentric axis e has turned in relation to the connecting-rod journall 5 also by the angle of $360^{o}$. During that time the piston 1 has performed also the stroke S. Rotation of the crankshaft by every further 360° causes repetition of the above described working cycle during which the piston 1 performs further two strokes S.

The crankthrow R spins in the direction marked with the full-line arrow, and the sleeve 4 spins in relation to the connecting-rod journal 5 in the direction marked with the full-line arrow.

In the case if the angular velocity $\omega_m$ =-160 $s^{-1}$, operation of the crank mechanism is similar, the eccentric sleeve 4 spinning in relation to the connecting-rod journal 5 in the direction opposite to the direction of the crankshaft 6, as marked with the broken line in fig.10 of the drawing.

Example of realisation V. The crank mechanism shown in fig.1, fig.2 and fig.3 of the drawing comprises a piston 1 connected with a connecting-rod 2 by means of a piston pin 3. Besides, it comprises an eccentric sleeve 4 being an intermediate element between the connecting-rod journal 5 of the crankshaft 6 and the big end of the connecting-rod 2. The internal axis of the sleeve 4 is moved in relation to the axis of the external cylindrical surface of the sleeve 4 by the eccentric size e equal to 3% of the crankthrow R of the crankshaft 6.

The control mechanism 10 of the angular position of the eccentric sleeve 4, as shown in fig.6 of the drawing, causes a definite position of the axis 11 of the sleeve 4, expressed by the angle

$\alpha_o = 30^o$, in relation to the crankthrow R of the crankshaft 6, determined at such a position of the crankthrow R in which the piston 1 is most distant from the crankshaft 6.

The control mechanism 10 of the angular position of the eccentric sleeve 4 influences the angular position of the eccentric sleeve 4 through the intermediary of a pair of external gear wheels 7 and 8, shown in fig.4 and fig.5 of the drawing, the gear wheel 7 being coupled with the eccentric sleeve 4, and the gear wheel 8 being coupled with the control mechanism 10.

The fifth mechanism operates in the below-described way. During rotation of the crankshaft 6 the eccentric sleeve 4 remains at rest in relation to the crankshaft 6, whereby the kinematic crankthrow R is unvariable and results from the predetermined angle $\alpha_o$, as shown in fig.15 of the drawing.

Example of realisation VI. The crank mechanism shown in fig.1, fig.2 and fig.3 of the drawing comprises a piston 1 connected with a connecting-rod 2 by means of a piston pin 3. Besides, it comprises an eccentric sleeve 4 being an intermediate element between the connecting-rod journal 5 of the crankshaft 6 and the big end of the connecting-rod 2. The axis of the internal hole of the sleeve 4 is moved in relation to the axis of the external cylindrical surface of the sleeve 4 by the eccentric size e equal to 4% of the crankthrow R of the crankshaft 6.

The control mechanism 10 of the angular position of the eccentric sleeve 4, as shown in fig.6 of the drawing, causes a definite position of the axis 11 of the sleeve 4, expressed by the angle $\alpha_o = 60^o$, in relation to the crankthrow R of the crankshaft 6, determined at such a position of the crankthrow R in which the piston 1 is most distant from the crankshaft 6.

The control mechanism 10 of the angular position of the eccentric sleeve 4 influences the angular position of the eccentric sleeve 4 through the intermediary of two pairs of external gear wheels 12,13 and 14,15, shown in fig.8 and fig.9 of the drawing, the gear wheels 13 and 14 being mounted on a common shaft 16 bearing-mounted in the arm of the crankshaft 6.

The fifth mechanism operates in the below-described way. During rotation of the crankshaft 6 the eccentric sleeve 4 remains at rest in relation to the crankshaft 6, whereby the kinematic crankthrow R is unvariable and results from the predetermined angle $\alpha o$, as shown in fig.15 of the drawing.

Example of realisation VII. The crank mechanism shown in fig.1, fig.2 and fig.3 of the drawing, comprises a piston 1 connected with a connecting--rod 2 by means of a piston pin 3. Besides, it comprises an eccentric sleeve 4 being an intermediate element between the connecting-rod journal 5 of the crankshaft 6 and the big end of the connecting-rod

2. The axis of the internal hole of the sleeve 4 is moved in relation to the axis of the external cylindrical surface of the sleeve 4 by the eccentric size e equal to 4.5% of the crankthrow R of the crankshaft 6.

The control mechanism 10 of the angular position of the eccentric sleeve 4, as shown in fig.6 of the drawing, causes a definite position of the axis 11 of the sleeve 4, expressed by the angle $\alpha_o \neq 120^{\circ}$, in relation to the crankthrow R of the crankshaft 6, determined at such a position of the crankthrow R in which the piston 1 is most distant from the crankshaft 6.

The control mechanism 10 of the angular position of the eccentric sleeve 4 influences the angular position of the eccentric sleeve 4 through the intermediary of a pair of gear wheels 17 and 18, shown in fig.11 and fig.12 of the drawing. The gear wheel 17 of said pair is of external gear, and the gear wheel 18 is of internal gear.

The seventh mechanism operates in the below-described way. During rotation of the crankshaft 6 the eccentric sleeve 4 remains at rest in relation to the crankshaft 6, whereby the crankthrow R is unvariable and results from the predetermined angle $\alpha_o$, as shown in fig.15 of the drawing.

Example of realisation VIII. The crank mechanism shown in fig.1, fig.2 and fig.3 of the drawing comprises a piston 1 connected with a connecting rod 2 by means of a piston pin 3. Besides, it comprises an eccentric sleeve 4 being an intermediate element between the connecting-rod journal 5 of the crankshaft 6 and the big end of the connecting-rod 2. The axis of the internal hole of the sleeve 4 is moved in relation to the axis of the external cylindrical surface of the sleeve 4 by the eccentric size e equal to 8% of the crankthrow R of the crankshaft 6.

The control mechanism 10 of the angular position of the eccentric sleeve 4, as shown in fig.6 of the drawing, causes a definite position of the axis 11 of the sleeve 4, expressed by the angle $\alpha o = 180^{o}$, in relation to the crankthrow R of the crankshaft 6, determined at such a position of the crankthrow R in which the piston 1 is most distant from the crankshaft 6.

The control mechanism 10 of the angular position of the eccentric sleeve 4 influences the angular position of the eccentric sleeve 4 through the intermediary of two pairs of gear wheels 19,20 and 21,22, shown in fig.13 and fig.14 of the drawing, the wheel 22 being of internal gear, and the wheels 20 and 21 being mounted on a common shaft 24 bearing-mounted in the arm of the crankshaft 6.

The eighth mechanism operates in the below-described way. During rotation of the crankshaft 6 the eccentric sleeve 4 remains at rest in relation to the crankshaft 6, whereby the kinematic crankthrow R is unvariable and results from the predetermined angle $\alpha o$, as shown in fig.15 of the drawing.

## Patent claims

1. Crank mechanism of the internal combustion piston engine with variable crankthrow, provided with a piston connected with a connecting-rod by means of a piston pin, and with a crankshaft, characterized in that it comprises an eccentric sleeve (4) being an intermediate element between the connecting-rod journal (5) of the crankshaft (6) and the big end of the connecting-rod (2), the axis of the internal hole of the sleeve (4) being moved in relation to the axis of the external cylindrical surface of the sleeve (4) by the eccentric size (e) which is greater than zero and smaller than or equal to 30% of the crankthrow (R) of the crankshaft (6).

2. Mechanism according to claim 1, characterized in that the eccentric sleeve (4) is connected with a driving gear provided with a control mechanism (10) of the angular position of the eccentric sleeve (4) by a definite angle ($\alpha o$) in relation to the crankthrow (R) of the crankshaft (6), determined at such a position of the crankthrow (R) in which the piston (1) is most distant from the crankshaft (6).

3. Mechanism according to claim 2, characterized in that the driving gear consists of the first pair of external gear wheels (7, 8), the first wheel (7) being coupled with the eccentric sleeve (4), and the second gear wheel (8) being coupled with the crankshaft (6).

4. Mechanism according to claim 2, characterized in that the driving gear consists of the first pair and the second pair of external gear wheels (12, 13) and (14,15), whereby the first wheel (12) of the first pair is coupled with the eccentric sleeve (4), and the second wheel (15) of the second pair is coupled with the crankshaft (6), and the second gear wheel (13) of the first pair and the first gear wheel (14) of the second pair are mounted on a common shaft (16) bearing-mounted in the arm of the crankshaft (6).

5. Mechanism according to claim 2, characterized in that the driving gear consists of a pair of gear wheels (17,18), the first gear wheel (17), of external gear, being coupled with the eccentric sleeve (4), and the second gear wheel (18), of internal gear, being coupled with the crankshaft (6).

6. Mechanism according to claim 2, characterized in that the driving gear consists of the first pair of external gear wheels (19,20) and the second pair of gear wheels (21,22), the first wheel (19) of the first pair being coupled with the eccentric sleeve (4), and the second wheel (22) of the second pair, of internal gear, being coupled with the crankshaft (6), and the second wheel (20) of the first pair and the first wheel of the second pair (21) being mounted on a common second shaft (24) bearing-mounted in the arm of the crankshaft (6).

7. Mechanism according to claim 1, characterized in

that the eccentric sleeve (4) has the angular velocity ($\omega m$) in relation to the connecting-rod journal (5) of the crankshaft (6) within the range of $\pm$ 1/2$\omega$ up to $\pm\omega$, where $\omega$ is the velocity of the crankshaft (6).

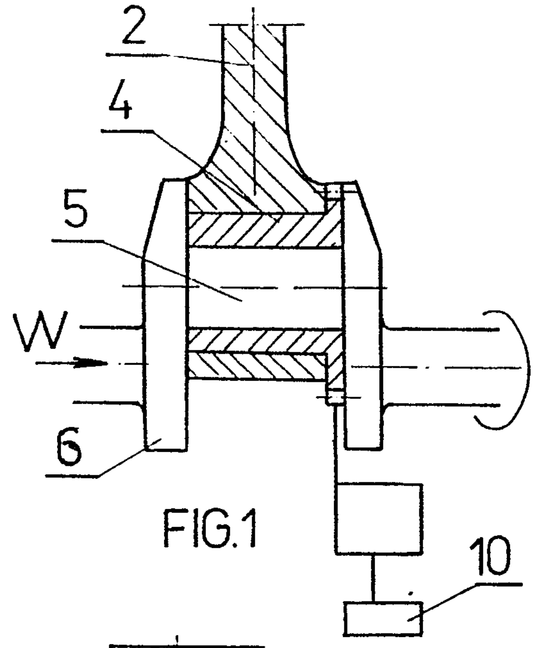


FIG.1

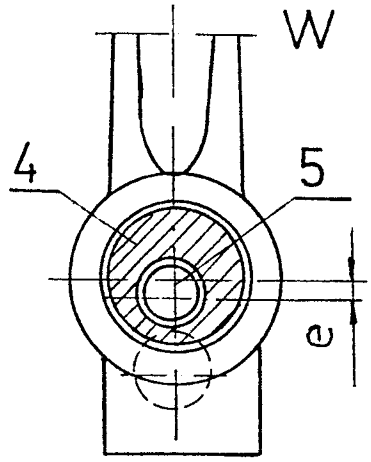


FIG. 2

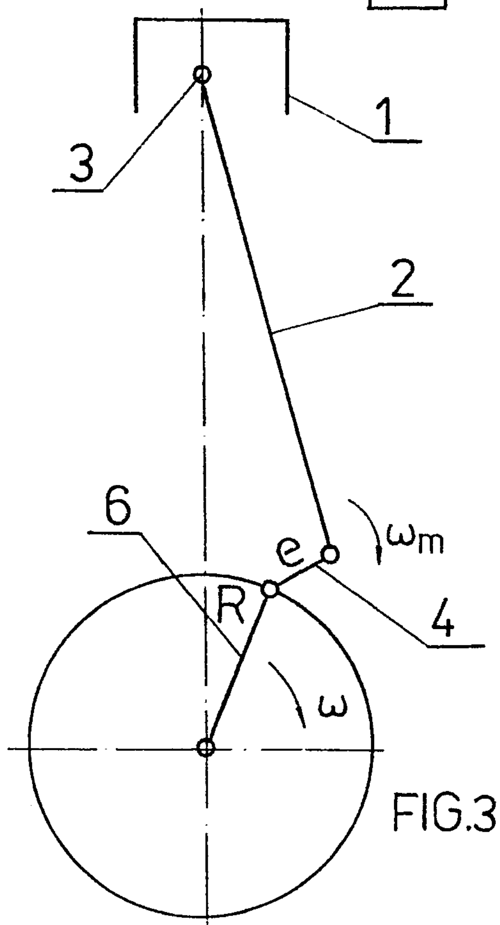


FIG.3

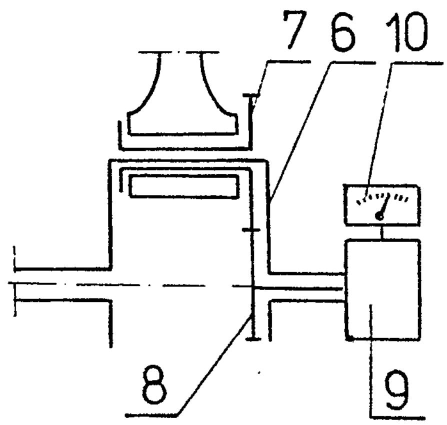


FIG.4

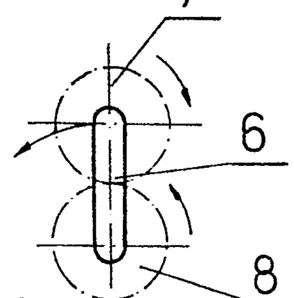


FIG.5

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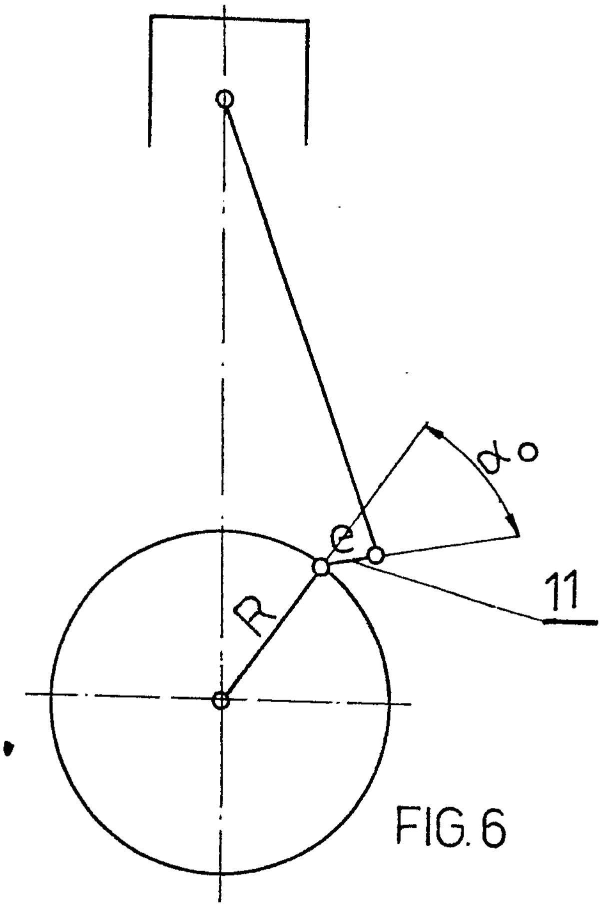

FIG. 6

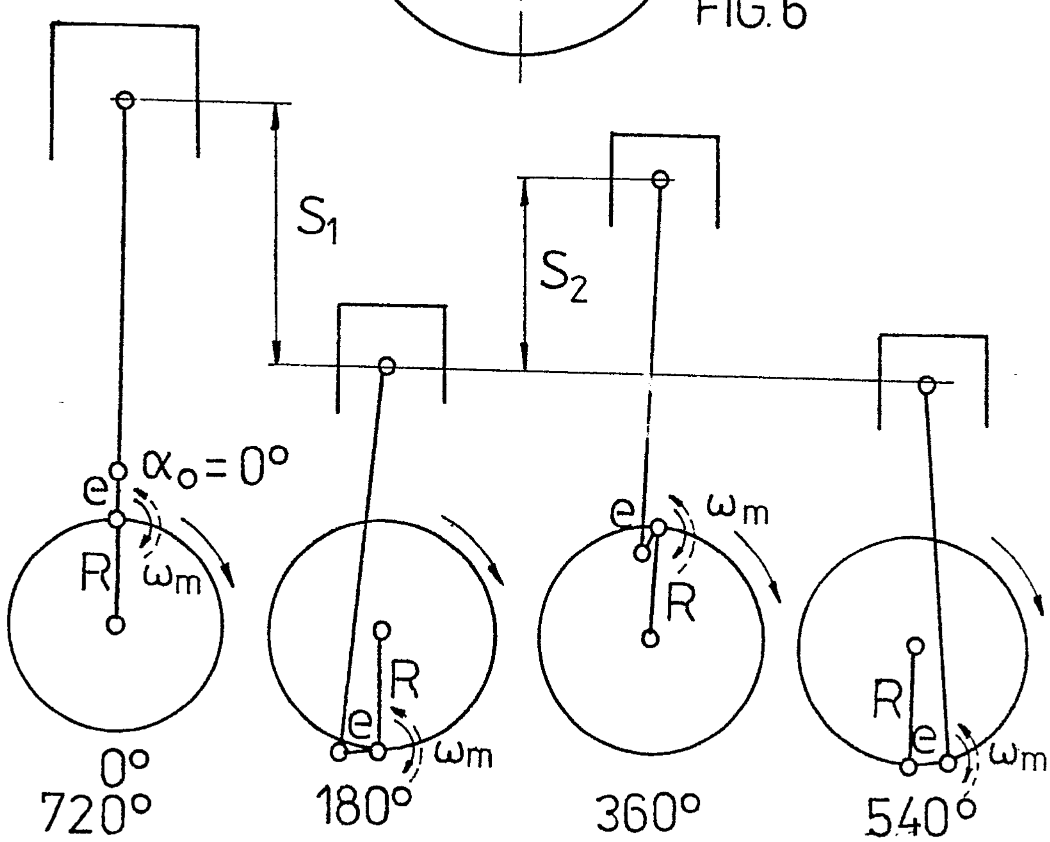

FIG.7

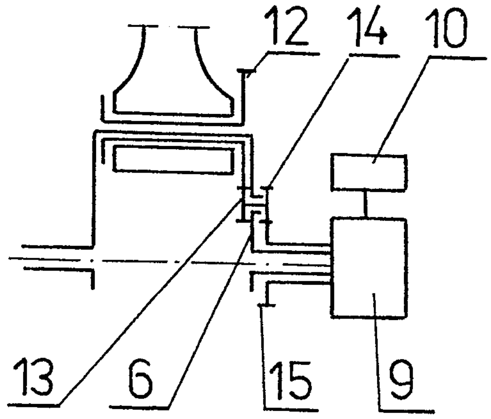


FIG.8

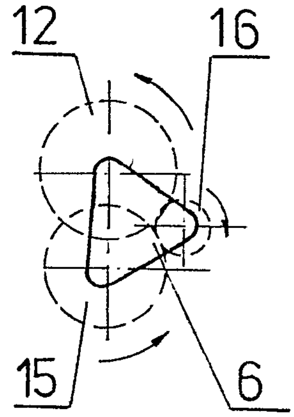


FIG.9

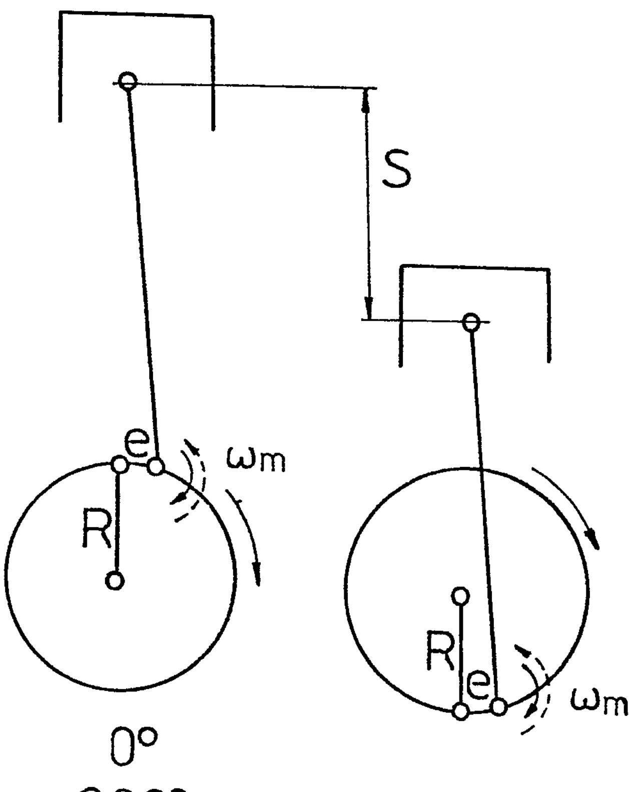


FIG.10

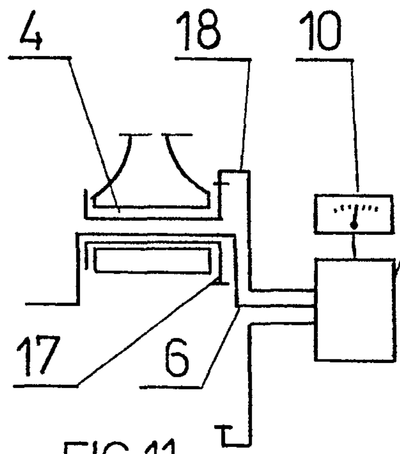


FIG.11

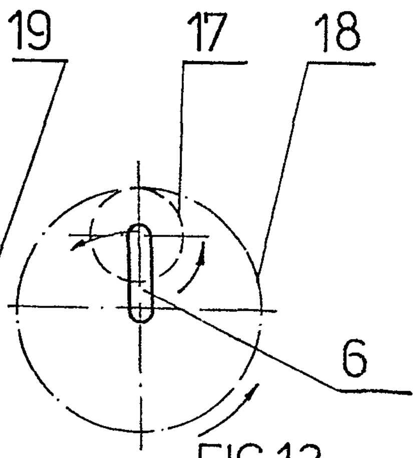


FIG.12

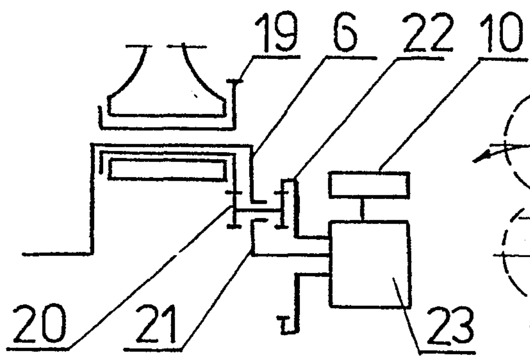


FIG.13

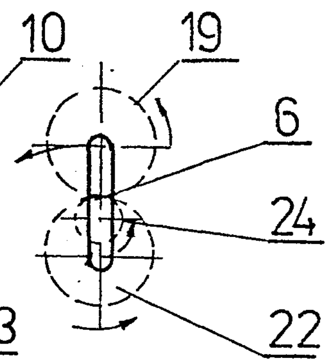


FIG.14.

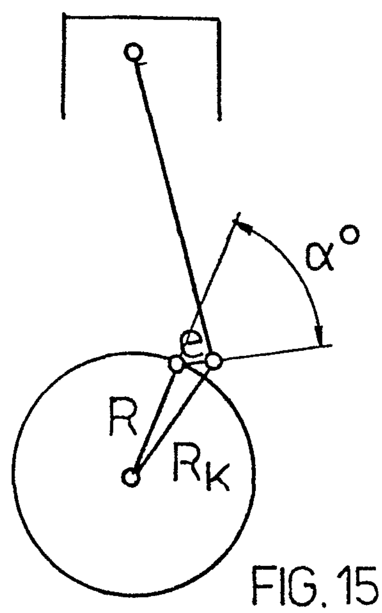


FIG. 15