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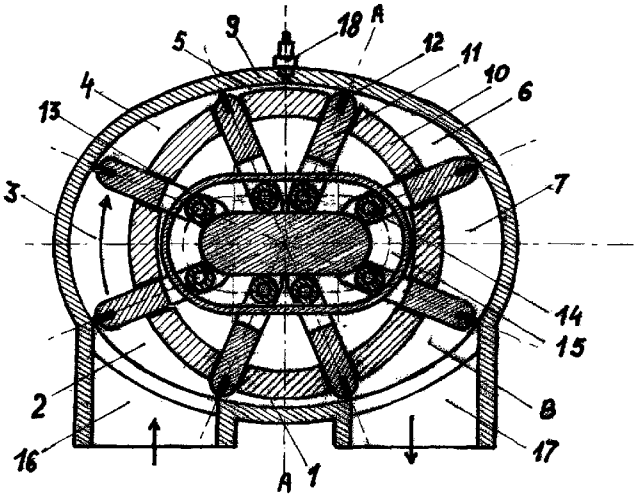

Fig. 1

Cross –section A-A

(57) Abstract: A four-stroke rotating engine with an elliptic shaped casing and a rotor with vanes moved by a copy mechanism belong to the field of internal combustion engines. The curve (22) of the elliptic casing (9) is designed according to copy mechanism (15) so that the tight-fitting wipers (12) on vanes (11) constantly touch the curve (22) in every position of the rotor (10) where chambers (1,2,3,4,5,6,7 and 8) are formed, each of a different volume, playing the role of the piston and cylinder found in piston engines. By appropriate design of the copy mechanism (15) and curve (22) of the elliptic casing (9) desired levels of compression are achieved so that engine operates in Otto and Diesel processes. In embodiment with eccentric copy mechanism (25) and corresponding curve (23) of the elliptic casing (9) desired levels of compression are achieved where volume of the expansion in chamber (7) is exceeding intake volume of the chamber (3) resulting with significantly higher level of expansion. By design of the channel (19) for conducting fire in the elliptic casing (9) ignition of the fuel mixture in chamber (5) is performed by the means of heated gases from chamber (6), thus resulting in reliable ignition of all kinds of fuels.

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FOUR-STROKE ROTATIONAL ENGINE WITH AN ELLIPTIC CASING AND A ROTOR WITH VANES POWERED BY A COPY MECHANISM

TECHNICAL FIELD

In a wider sense, the invention falls under mechanical engineering. To narrow it down, it is an internal combustion prime mover with rotating and radially movable vanes. Markings according to the International Patent Classification (ICP)7 are: F 01C 1/00.

TECHNICAL PROBLEM

How to design an internal combustion engine that will, in relation to currently known and applied engines have:

- simpler production
- a greater level of thermal efficiency
- a greater overall level of efficiency
- a greater power per an unit of mass
- the ability to consume various types of fuel
- better compliance with environment protection standards
- better applicability wherever internal combustion engines are used.

STATE OF THE ART

Currently, mostly piston engines are used, like Diesel or Otto engines, two-stroke or four-stroke engines. The efficiency of Diesel engines varies from 32% to 54%, and Otto engines from 22% to 36%. These engines are heavy, cumbersome, very complex in design, with a lot of expensive parts. Of all the rotational engines, only the Wankel engine is in use. The advantages of the Wankel engine in relation to piston engines is a somewhat simpler design, better balance, a greater rpm and a lower weight per unit of power. The disadvantages are: lower levels of compression so it cannot be used as the Diesel engine, a lower level of

thermal efficiency, higher fuel consumption, and a shorter life-time, so that it is usually implemented for special purposes, where greater power per unit of weight is required.

SUMARY OF THE INVENTION

The engine consists of an elliptic casing, a rotor with vanes that, owing to the copy mechanism, allows them to maintain contact with the elliptic casing in all positions. The number of vanes may vary, but we will describe an 8-vane function. There are intake and exhaust channels at the housing which are permanently open. Between the casing, the rotor and the two adjacent vanes symmetrically placed in relation to the shorter diagonal 'd', a chamber is formed with a minimal volume. Such position corresponds to the upper dead point of the piston engines. This happens on both ends of the shorter diagonal 'd', thus the engine has two such the spaces. One is used for exhaust, and the other for compression. Similarly, the space formed by the casing, the rotor and two adjacent vanes at the ends of the longer diagonal 'D' is maximum volume corresponding to two lower dead points of the engine. The relation of the volume at the intake side and the volume of compression is the compression rate, while the relation of volume at the exhaust side and the volume of compression is the expansion rate. With an appropriate elliptical design of the casing and a copy mechanism for moving the vanes, the required compression ratio and a significantly higher expansion rate can be achieved. This allows us to achieve an power efficiency higher than all currently known engines. The rotation of the vanes causes them to automatically open and close the intake and exhaust channels, so there is no need for any additional mechanisms that will open and close them. The symmetric design of the rotor with vanes provides the best balance of the engine and enables a great rpm number, as well as greater power per unit of weight. The lower fuel consumption makes it possible to use various types of fuel, with a lower exhaust gas temperatures and lower content of harmful components, resulting in a dramatic decrease of noise and achievement of special ecology and energy benefits. To top it all, the simple design results in low production cost, which provides a significant advantage for this invention as opposed to solutions known to date.

SHORT PICTURE AND BLUEPRINT DESCRIPTION

Picture 1: A cross section of the engine in its basic eight-vane version

Picture 2: A diagonal cross section of the engine

Picture 3: A cross section of the engine in its asymmetric design of the copy mechanism and the elliptic casing with eight vanes.

DETAILED DESCRIPTION

The illustrations show a four-stroke rotating engine with an elliptic shaped casing and a rotor with vanes moved by a copy mechanism that consists of an immobile copy mechanism 15, a rotor 10 with eight symmetrically distributed channels 20 where the vanes 11 are situated. The vanes are joined together by joints to the copy mechanism 15 by means of a small rod 14, a wheel 13, an elliptic casing 9 with an intake channel 16 and an exhaust channel 17.

Inside the space formed by adjacent vanes, the rotor and a curve 22 of the elliptic casing 9, chambers 1,2,3,4,5,6,7 and 8 are formed, each of a different volume, playing the role of the piston and cylinder found in piston engines. The number of vanes can be less or more then eight – this doesn't alter the basic design of the invention. The curve 22 of the elliptic casing 9 is designed so that the tight-fitting wipers 12 on vanes 11 constantly touch the curve 22 in every position of the rotor 10. The vanes 11 slide inside the channel 20 of rotor 10, powered by the copy mechanism 15 by means of wheel 13 and rod 14.

The chamber 1 corresponds to the upper dead point of the exhaust, so that the turning of the rotor 10 in the direction of the spinning of the 24 vanes 11 opens the intake channel 16 and the chamber 1 reaches the position of chamber 2, thus increasing its volume and performing and intake that continues until position 3, which corresponds to the lower dead point of the intake. Further rotation of the rotor 10 initiates the reduction of volume in the chamber and produces compression through the position of the chamber 4 until the position 5 of the chamber which corresponds to the upper dead point of compression. This is where ignition of the compressed mixture is conducted by a spark-plug 18 imbedded in the elliptic casing 9.

Ignition of the mixture increases the pressure inside chamber 5, pushing the vane 11 into position of chamber 6, thus creating the torque and expansion when arriving at the position of chamber 7 that corresponds to the lower dead point of expansion. Further rotation of the rotor, the vane 11 opens the exhaust channel 17 and initiates the exhaust through the position of chamber 8 until it again reaches the position of chamber 1 corresponding the upper dead point of exhaust.

This cycle is repeated by all the chambers; 1,2,3,4,5,6,7 and 8, which means that the number of vanes corresponds to the number of cylinders, in this case making this an eight-cylinder engine, with eight ignitions in one turn of the rotor 10.

The ratio of the chamber 3 volume and chamber 5 volumes represent the compression ratio. This is determined by design of the copy mechanism 15, the elliptic casing curve 22, the casing 9, rotor 10 and the number of vanes 11. The ratio of chamber 7 volume and the chamber 5 volumes represent the expansion ratio, which doesn't have to be the same as the compression ratio. This is illustrated by the eccentric copy mechanism design 25 and the corresponding curve 23 of the elliptic casing 9 that has an imbedded injector 21, which means that this engine conducts a Diesel process. This again means that it can achieve a high compression ratio - over 20, and that the expansion ratio is even higher, which drastically increases the efficiency ratio, much better than and engine known today.

The intake channel 16 and exhaust channel 17 are permanently open, which is done by the vanes 11 that open and close them, eliminating the need for an additional mechanism. Gradual opening of exhaust channel 17 does not cause an explosion as when the exhaust valve is opened in a piston engine, so there is no noise – environmentally fully acceptable.

The design of the eccentrical copy mechanism has a significantly increased expansion ratio, which means that fuel consumption is significantly reduced as well as the exhaust gas temperatures. This is a praiseworthy contribution to energy preservation, ecology and reduced heating of the atmosphere.

The elliptic casing can hold a channel 19 for conducting fire. The result is that hot gas from chamber 6, at an appropriate time pass into chamber 5 and cause ignition, so that the spark-plug is needed only for the first ignition. Ignition through channel 19 can result in a more efficient ignition and a more reliable working of the engine, as well as efficient ignition of various types of fuel.

It is obvious that this invention can be applied in all cases where internal combustion engines are used.

CLAIM

1. Four-stroke rotational engine with an elliptic casing and a rotor with vanes powered by a copy mechanism consisting of copy mechanism (15); rotor (10) with symmetrically distributed channels (20) where vanes (11), with tight-fitting wipers (12) on top, slide inside the channel (20), where vanes (11) are connected with copy mechanism (15) by means of wheel (13) and rod (14); a spark-plug (18) imbedded in the elliptic casing (9), **characterized by that** curve (22) of the elliptic casing (9) is determined by design of the copy mechanism (15) so that the tight-fitting wipers (12) on vanes (11) constantly touch the curve (22) of the elliptic casing (9) in every position of the rotor (10).

2. Engine with eccentric copy mechanism (25); curve (23) of the elliptic casing (9) that has an imbedded injector (21) according to the claim 1, **characterized by that** volume of chamber (7) exceeds the volume of chamber (3).

3. Engine according to claims 1 and 2, **characterized by that** on elliptic casing (9) is carried out a channel (19) for conducting fire.

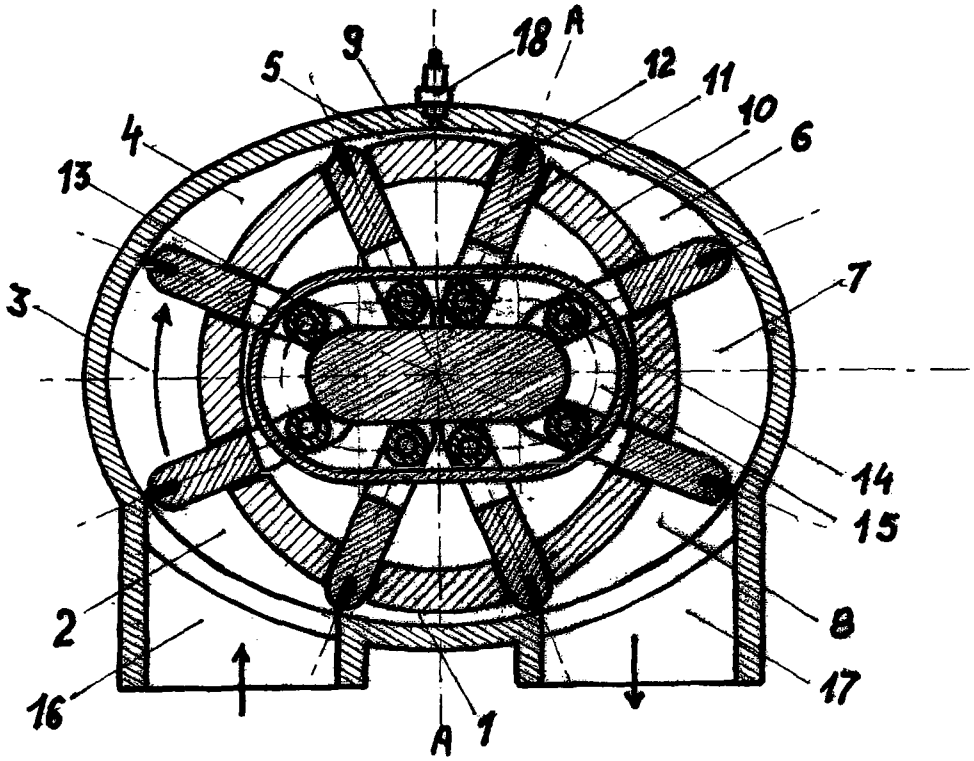

Fig. 1

Cross –section A-A

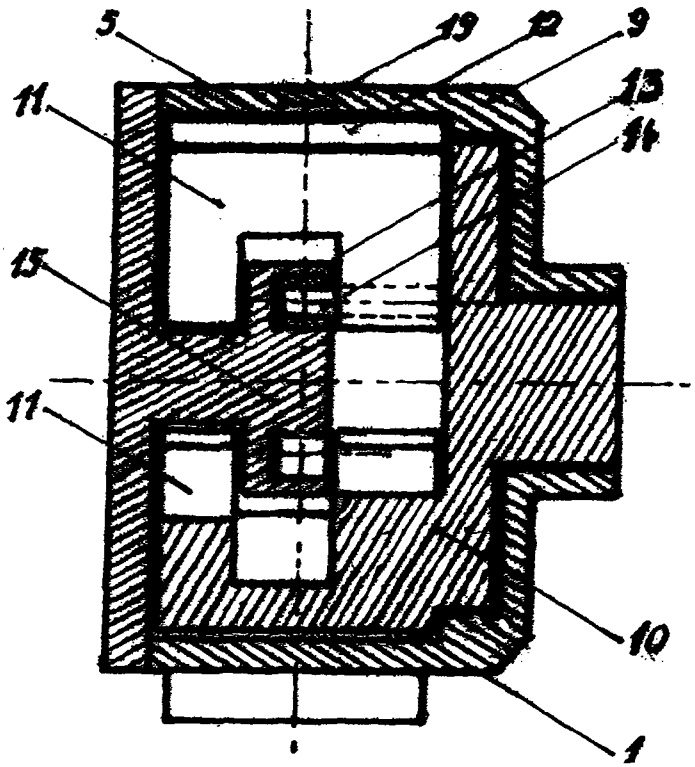

Fig. 2

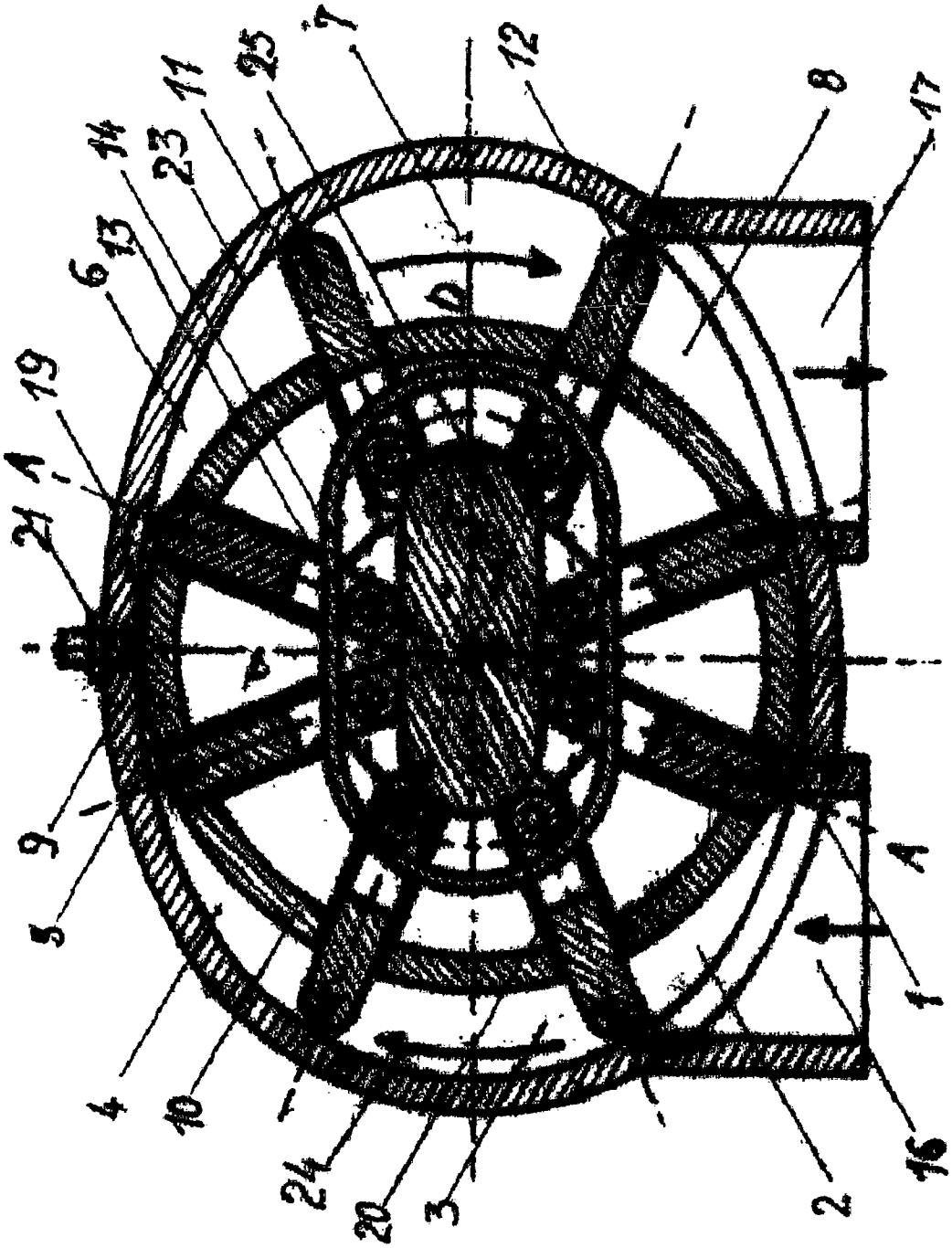

Fig. 3