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(54) Titre : PROCEDE DE FONCTIONNEMENT D'UN MOTEUR A PISTON ROTATIF ET MOTEUR A PISTON ROTATIF A COMBUSTION INTERNE

(54) Title: OPERATING METHOD FOR A ROTARY ENGINE AND A ROTARY INTERNAL COMBUSTION ENGINE

(57) Abrégé/Abstract:
The invention relates to engine engineering, in particular to operating methods of rotary internal combustion engines and the design structure thereof. The aim of the invention is to increase the economy of fuel and improve ecological properties of an engine using an optimal scheme of force application (produced by the pressure of combustion products) to the working shaft of the engine by means of a rotor. The inventive method consists in moving a compression chamber by rotors outside a working chamber and in relation thereto, starting from the end of compression of fuel-air mixture until the combustion products thereof are transferred to the working chamber. A screen is arranged in the working chamber in such a way that it separates a suction port from an exhaust nozzle. Said rotary engine can also be provided with several compression chambers for one working chamber and with several working chambers for one compression chamber.

Abstract

ROTARY INTERNAL-COMBUSTION ENGINE

The invention relates to propulsion engineering and particularly to internal-combustion engines. The problem solved by the present invention is improving fuel efficiency and ecological compatibility, as well as providing the ability to set advance ignition at higher rotation, increasing the rotation frequency of the working shaft and decreasing its vibration, thus making the manufacture of such engines more cost effective. This problem is solved by the operational rotor being oval-shaped when viewed in cross-section, whilst the compression rotor being square-shaped when viewed in cross-section. Due to this arrangement, in particular by making an operational rotor of a rotary internal-combustion engine oval-shaped, while making a compression rotor square-shaped, we achieve more efficient application of active forces (due to the pressure from combustion materials within the combustible mixture) to a working shaft through a rotor. The rotary internal-combustion engine is comprised of a housing (1) where rotors (2) and (3) are mounted in its chambers; the housing is provided with an intake port (4) and an exhaust port (5), and the housing of the engine is provided with lids (6) on which bearings (7) of the rotors are mounted co-axially with the chambers of the housing. The rotor (3) is connected with the working shaft 8, while both rotors comprise spring-loaded blades (9) and are connected through the transmission (10) (for example, gear-type transmission) providing interrelated rotation of the rotors. The blades (9) may be equipped with the counter-loads (11) (Fig. 4) in order to reduce pressure from the centrifugal force resulting due to their pressing toward the housing of the engine during the operation of the engine. The compression chamber (12) holds the fuel injector or igniter plug (13). The housing also has the working chamber (14) where the screen (15, 16, 17) isolates the intake port from the exhaust port. The screen may be made in the form of the spring-loaded plate 16 (Fig. 2, 5, 6), the gaseous (ex., air) barrier (15) (Fig. 1, in case of engines using pressurisation) or in the form of the rotor (17) (Fig. 3). The spring-loaded blades (9) serve as gaskets between the rotors, housing and lids of the engine. These blades can not perform reciprocal movement in slots of

rotors rotating within cylindrical chambers of the engine housing. However, the blades (9) can move reciprocally in slots of the rotors when the latter rotate in the non-cylindrical chambers of the housing, which provides increased degree of compression, increased capacity and torque as compared with an engine in which blades can not move reciprocally. The engine is also provided with a fuel system, ignition system, lubricating system, cooling system and gaseous distribution system.

(1 independent claim, 6 drawings)

AMENDED SHEET

ROTARY INTERNAL-COMBUSTION ENGINE

1. Field of the invention

The invention relates to propulsion engineering and particularly to internal-combustion engines.

2. Prior art

US Patent 3,951,111, F02B 53/08, 1976 discloses a rotary internal-combustion engine comprised of two rotors provided with two sliding blades forming together with flanges of slide valves a charging tank and an engine chamber, characterised in that its operation is based on a four-stroke cycle in which a compressed and ready for ignition combustible mixture is cross-injected between the charging tank of the first cylinder and the engine chamber of the second cylinder after a compression stroke.

A disadvantage of such engine is that injection of compressed combustible mixture from the charging tank to the engine chamber lowers efficiency of the compression stroke. Additionally, inability to set advance ignition at higher rotation results in fuel inefficiency and poor ecological compatibility. This also lowers rotation frequency of an engine working shaft.

The closest prior art for the present invention is constituted by a rotary internal-combustion engine which comprises two cylinders sharing the same axis and including two off-centre rotors with four radial sliding blades each of which has two slots accommodating the ends of stay-spring rods (US Patent No. 3,858,550, class F02B 53/08, 1975).

This solution is disadvantageous in that unilateral dislocation of a rotor from an axis causes enhanced vibration in an engine due to sliding rotor blades. Furthermore,

inability to set advance ignition (at higher rotation) results in fuel inefficiency and poor ecological compatibility. This also lowers rotation frequency of the working shaft in an engine.

3. Disclosure of the invention

The problem solved by the present invention is improving fuel efficiency and ecological compatibility of an engine, providing it with the ability to set advance ignition (at higher rotation), increasing the rotation frequency of a working shaft and decreasing its vibration, as well as making the manufacturing of such engines more cost effective.

The said problem is solved in a rotary internal-combustion engine wherein the housing, comprised of lids, an intake port and exhaust port, holds an operational rotor and compression rotor gasketed against the walls of the housing, its lids and between each other, thus forming with them operational and compression chambers, the rotors being configured so that the operational rotor is oval-shaped when viewed in cross-section, whilst the compression rotor is square-shaped when viewed in cross-section.

Due to this arrangement, in particular by making the operational rotor of a rotary internal-combustion engine oval-shaped, while making a compression rotor square-shaped, one may achieve more efficient application of active forces (due to the pressure from the combustion materials within the combustible mixture) to an operational rotor mounted on an engine shaft.

4. Brief description of the drawings

Fig. 1 shows a cross-section of the engine (with pressurisation) with the air barrier separating the intake port from the exhaust port;

Fig. 2 shows a cross-section of an engine with a spring-loaded blade separating the intake port from the exhaust port;

Fig. 3 shows a cross-section of the rotary engine wherein the rotor separates the intake port from the exhaust port;

Fig. 4 shows a longitudinal section of the engine;

Fig. 5 shows the engine when viewed in longitudinal section, corresponding to two strokes: "compression" and "power-stroke";

Fig. 6 shows the engine when viewed in longitudinal section, corresponding to the simultaneous strokes "intake" and "exhaust".

5. Embodiments

The rotary internal-combustion engine according to the invention is comprised of a housing (1) where rotors (2) and (3) are mounted in chambers of housing (1); the housing is provided with an intake port (4) and an exhaust port (5), and the housing of the engine is provided with lids (6) (Fig. 4) on which bearings (7) of the rotors are mounted co-axially with the chambers of the housing. The rotor (3) is connected with the working shaft (8), while both rotors comprise spring-loaded blades (9) and are connected with each other through the transmission (10) (for example, gear-type transmission) providing interrelated rotation of the rotors. The blades (9) may be equipped with the counter-loads (11) (Fig. 4) in order to reduce pressure from the centrifugal force resulting due to their pressing toward the housing of the engine during the operation of the engine. The compression chamber (12) (Figs. 1, 2, 3, 5, 6) holds the fuel injector or igniter plug (13). The intake port may be separated from the exhaust port with the gaseous (ex., air) barrier (15) (Fig. 1) in case of engines using pressurisation, with the spring-loaded plate (16) (Fig. 2) or with the rotor (17) (Fig. 3).

The spring-loaded blades (9) serve as gaskets between the rotors, housing and lids of the engine. These blades can not perform reciprocal movement in slots of rotors rotating within cylindrical chambers of the engine housing. However, the blades (9) can

move reciprocally in slots of the rotors when the latter rotate in non-cylindrical chambers of the housing, which provides increased degree of compression and an increased capacity and torque as compared with an engine in which blades can not move reciprocally.

The engine is also provided with a fuel system, ignition system, lubricating system, cooling system and gaseous distribution system.

The operation of the engine according to the invention is showed on Fig. 5 and 6.

On start-up, the rotors (2) and (3) start rotating thus forming and moving the compression chamber (12) and the working chamber (14), while modifying their volumes.

During the "intake" stroke, components of combustible mixture are injected in chamber A (with its volume being increased) through the intake port (4) (Fig. 6). These components are then compressed to the volume of the compression chamber (12) during the "compression" stroke (Fig. 5). Afterwards moving of the chamber (12) occurs, where ignition takes place (in advance, if necessary) and where combustible mixture combusts yielding combustion materials further directed in the working chamber (14) (Fig. 5). Afterwards the "power-stroke" is performed and the rotor (3) connected to the working shaft (8) is rotated. Discharge combustion materials (exhaust) are discharged from the chamber B (Fig. 6) of the engine through the exhaust port (5), thus performing the "exhaust" stroke.

The four-stroke operational cycle of the rotary engine is repeated.

The use of the rotary internal-combustion engine according to the invention allows to make it more cost-effective and ecologically compatible, increase rotation frequency of the working shaft of this engine due to providing advance ignition which does not cause

negative torque in the engine and to reduce vibration of the engine due to placing its rotors co-axially with chambers in the housing where they are mounted, as well as to make the manufacture of such an engine more cost-effective due to the simplicity of its design.

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AMENDED SHEET

CLAIMS

1. A rotary internal-combustion engine wherein the housing, comprised of lids, an intake port and exhaust port, holds an operational rotor and compression rotor gasketed against the walls of the housing, the lids and between each other, thus forming with them operational and compression chambers, ***characterised in that*** the rotors are configured so that the operational rotor is oval-shaped when viewed in cross-section, whilst the compression rotor is square-shaped when viewed in cross-section.

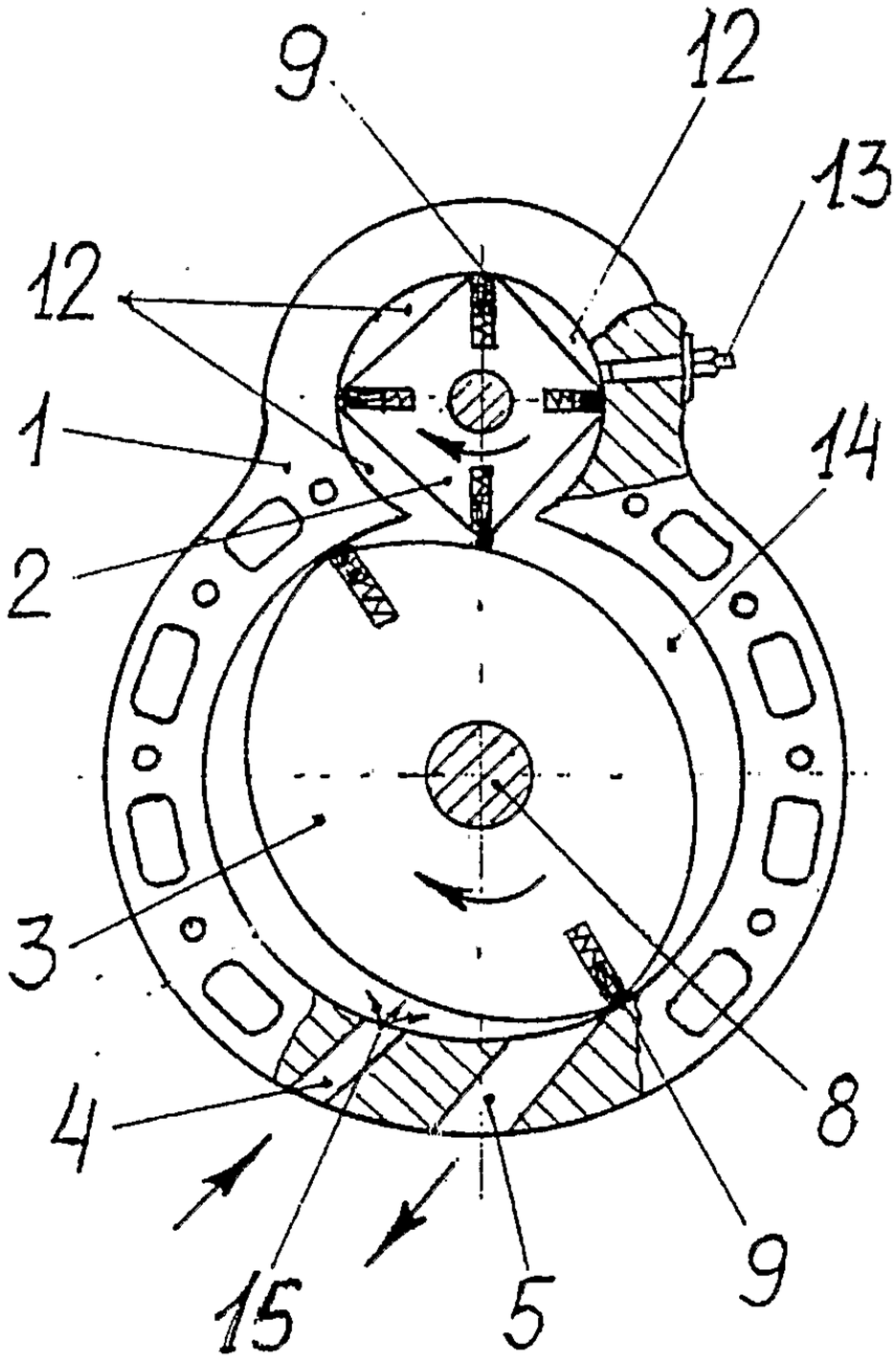

Fig. 1

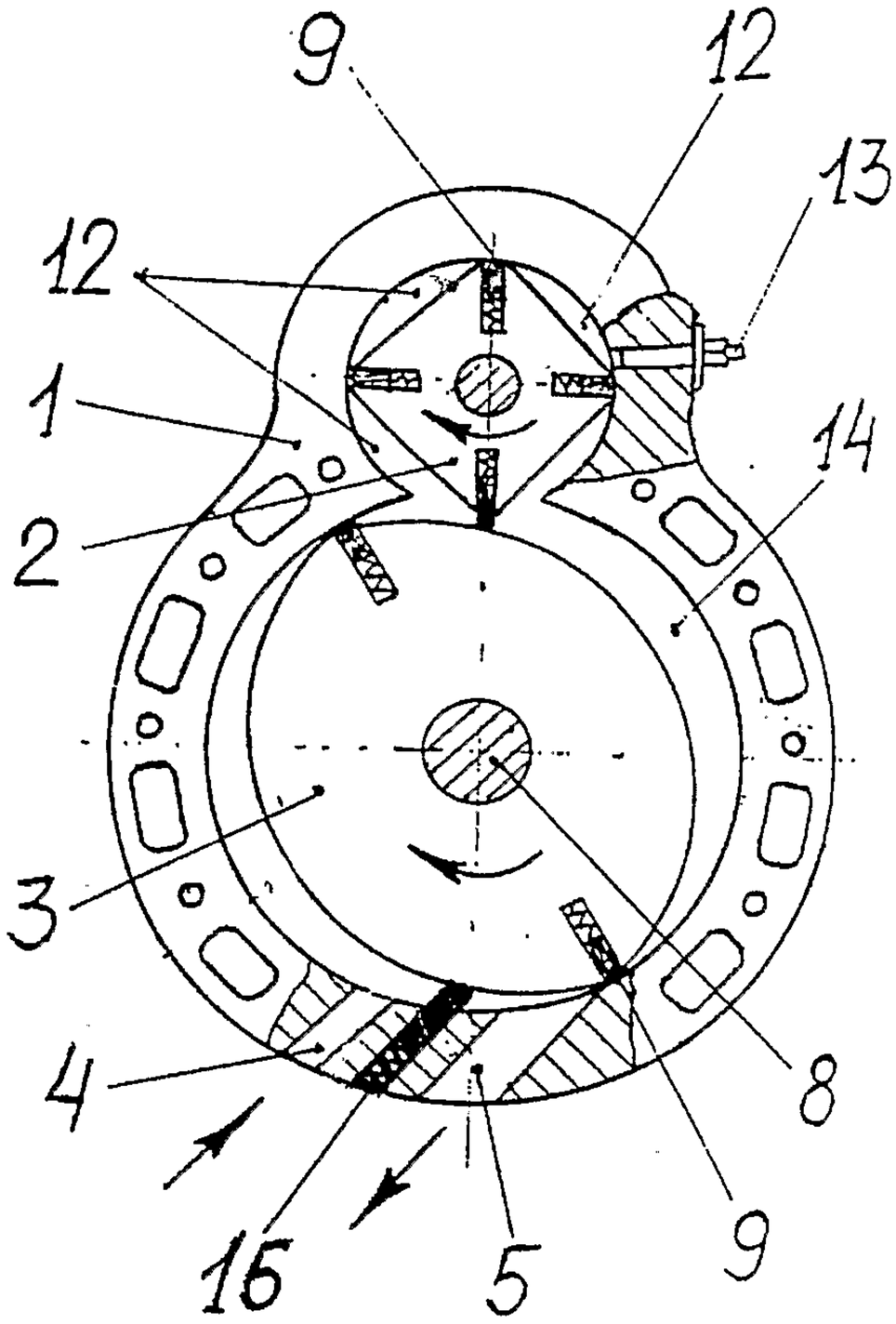

Fig. 2

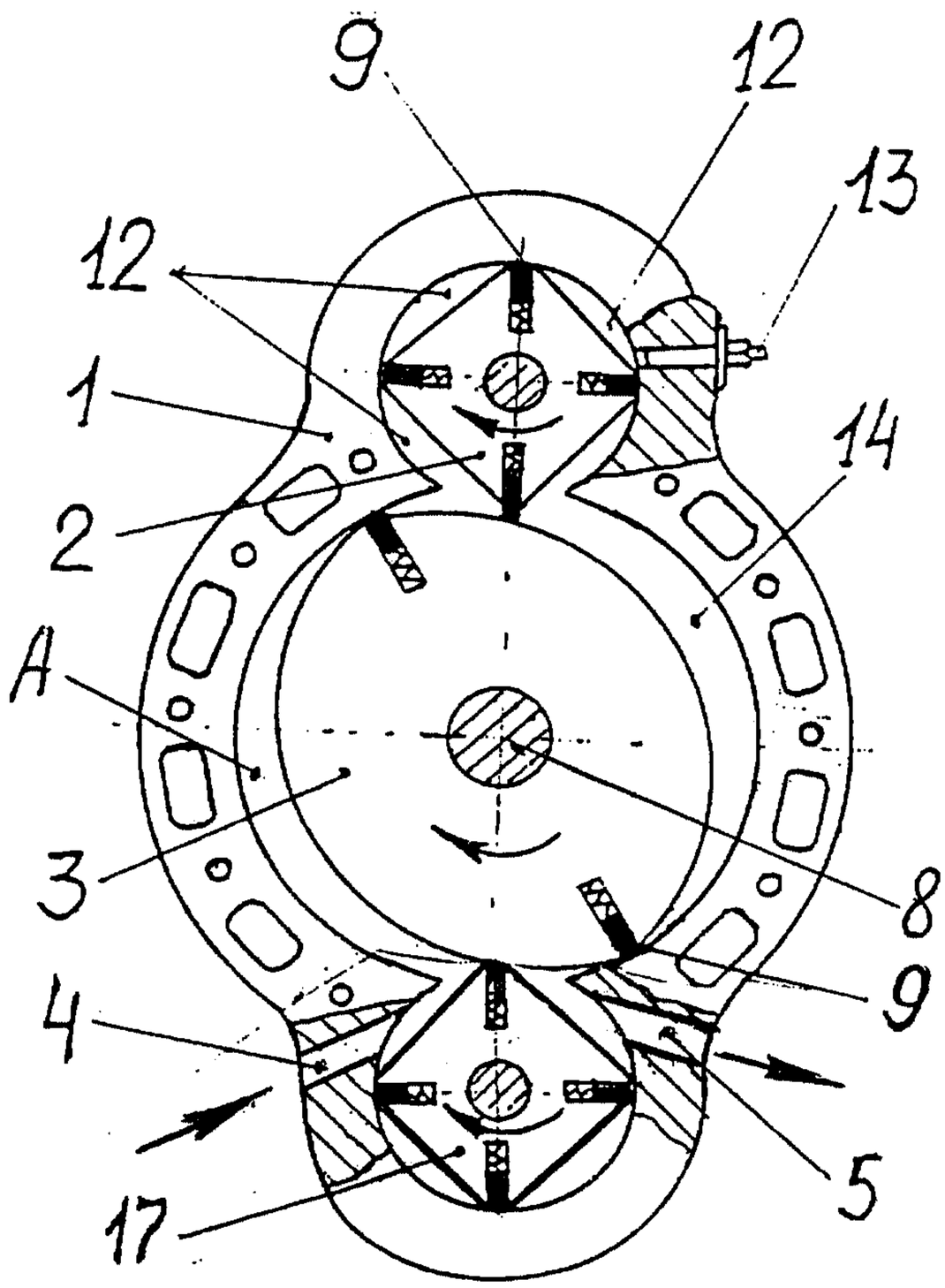

Fig. 3

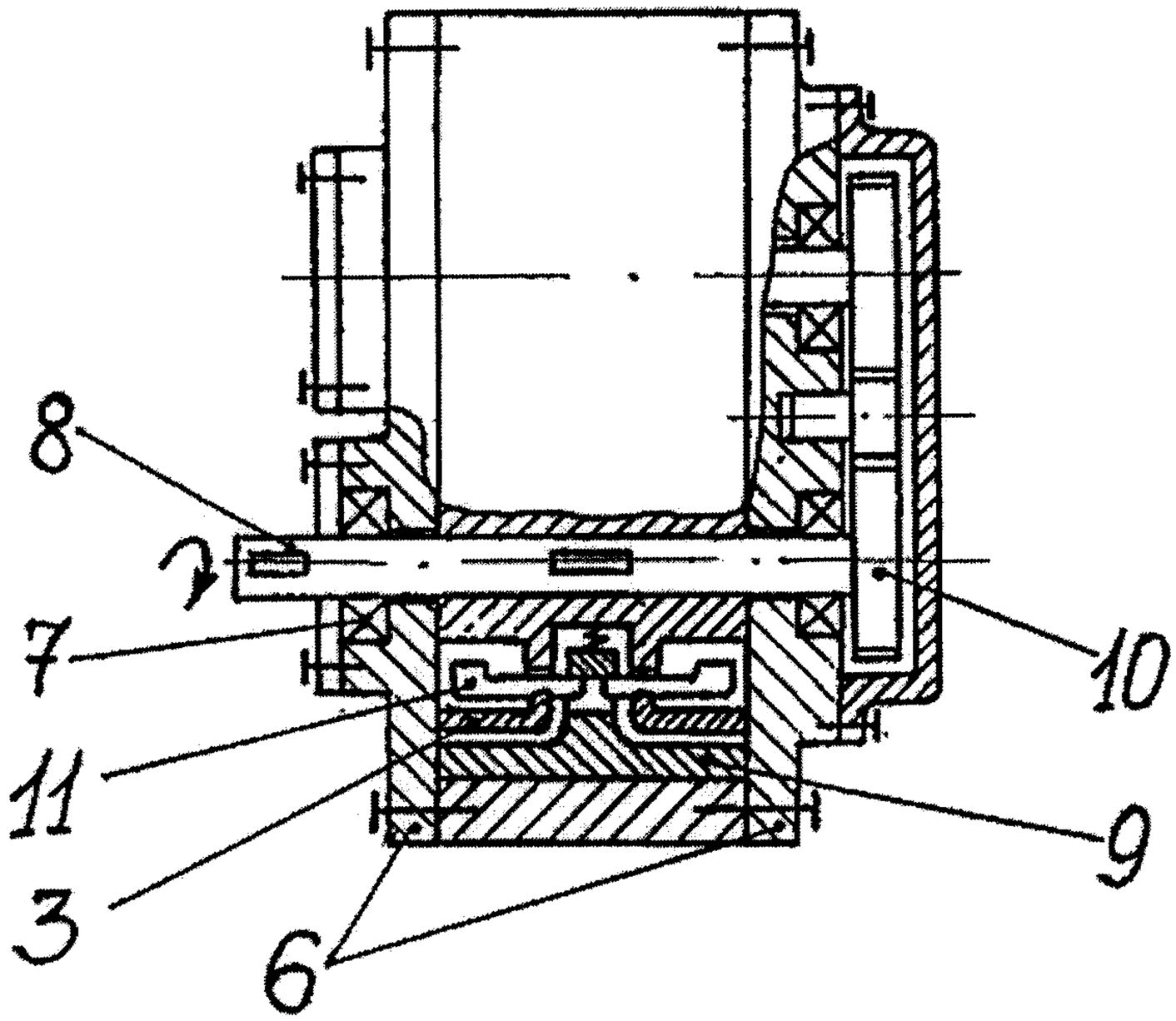

Fig. 4

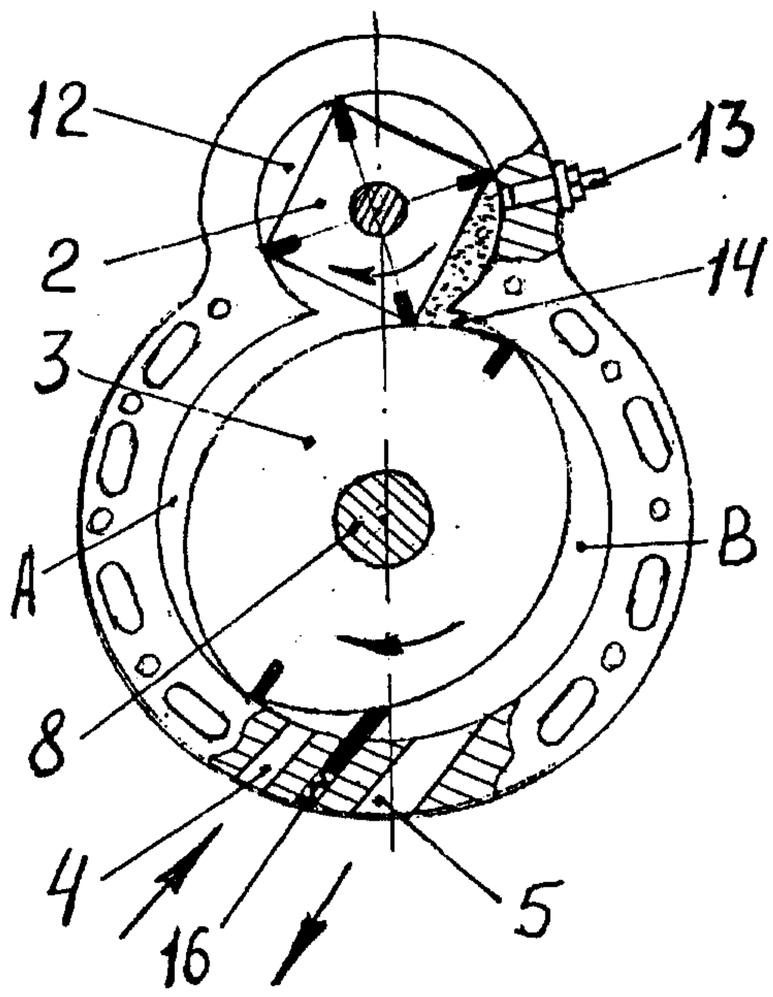

Fig. 5

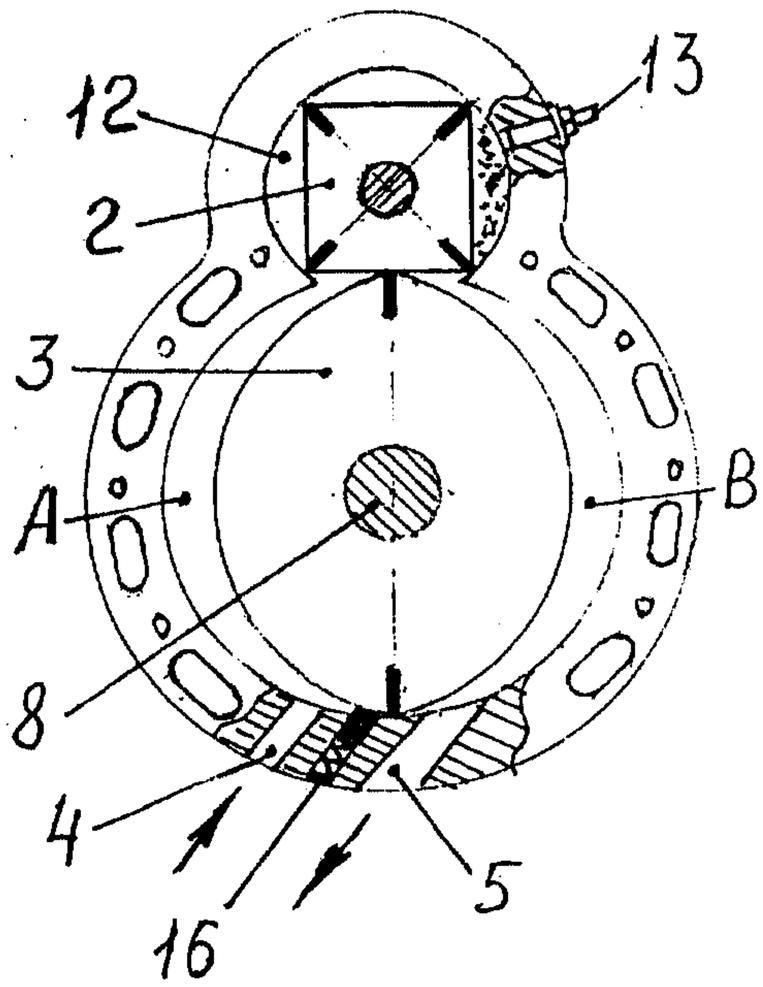

Fig. 6