

DESCRIPTION OF THE DESIGN PATENT TITLED:

**VARIABLE VOLUME CRANKSHAFT ASSY WITH THE FUNCTION OF COMPRESSOR FOR 2-STROKE ENGINES**

This invention relates to the crankshaft assy of 2-stroke propulsors of all types. The most important qualities of this type of engines are its lightness, simplicity and economy of construction, but it is currently used only in small displacements due to the high consumption and excessive pollution, mainly caused by the loss of unburned hydrocarbons from exhaust port. One of the main defects of existing engines with two-stroke cycle is to have a low pressure of pumping ( 0.2 - 0.4 bar) which results in a low value of torque as a function of number of cycles. This problem forced manufacturers to reduce to a minimum the spaces inside the pump-case with several solutions but in certain points of the same it is not physically possible - the inner part of the piston, the area of movement of the connecting rod and the space occupied by transfer ducts. In these areas the fresh gases are compressed in the descent phase of the piston but the gas being compressible do not allow an appropriate increase of the washing pressure that is given only by the volume of air that the piston compresses on the down stroke and equivalent to the displacement. This invention is therefore directed to solve these problems, considering that in the near future there will be a significant development of injection direct gasoline in the head that will become mandatory in Formula 1 engines from 2014 and it will bring a development of this technology which can be applied to 2-stroke engines, making them more current and clean. The purpose of this invention is to greatly increase the washing pressure of the fresh gas in the pump-case and not being able to use expensive turbo compressors due to the low exhaust pressure, and make sure to be able to have a diagram of opening of the exhaust ports and transfer less supercharged. This fact allows to better exploit the stroke of the piston in the expansion of the gases (more torque) and improve the washing and with a higher pressure of the fresh gas inlet of the cylinder, improve the combustion. Theoretically it is possible though a small stroke of the mobile

crankshaft outer to almost double the volume aspirated, because the fixed crankshaft outer of the same can have large diameters without affecting the operation of the engine, but only lengthening the connecting rod. The closing phase of the mobile crankshaft outer may not be symmetrical, since it is released by the distribution diagram commanded by the piston, allowing to prolong the time of closure of the mobile crankshaft outer with obvious benefits for the stage of washing or transfer. This invention can be applied to all existing 2T engines without major structural intervention, concerning only the crankshaft assy and marginally the crankcase. Another advantage of this solution concerns the balancing of the crank shaft. As previously shown, manufacturers of 2T engines are forced to realize the crankshaft outer of the crankshaft assy in a cylindrical shape to minimize the space inside the pump case, but the ideal configuration for the balance of the reciprocating masses of the crankshaft assy is the crankshaft, as is in the 4-stroke engines, in order to counterbalance the weight of the connecting rod and the piston. The invention, using two mobile crankshaft outer covering the fixed crankshaft outer RH or LH of the crankshaft assy, allows to properly size this component, without increasing the spaces in the pump-case, also using a crankshaft shape without resorting to expensive counter- balancing shafts which absorb power, as often happens in the modern trends. Any vibrations that may be created by the axial movement of the mobile crankshaft outer covering the fixed crankshaft outer of the crankshaft assy cancel each other having an opposite motion. According to the invention, the device has the characteristics indicated in the independent claims 1. Further advantageous features of this device are indicated in the dependent claims. The characteristics and advantages of the invention will now be described in more detail, also with the aid of the attached pictures which illustrate one or more non - limiting examples. Obviously, the same reference numbers in the various pictures indicate same or equivalent parts.

Figure 1.1 and 1.2 is a schematic view of a crankshaft assy for two-stroke engines equipped with the device according to the invention with axial motion of the mobile crankshaft outer (5) with respect to the rotation of the motor shaft whose characteristic is to have movement in phase expansion controlled by the connecting rod (1) though some cams (8) present on the head of the connecting rod (1) and in the compression phase by one or more cams (9) integral with the crankcase (3) whose track (11) where they work is formed on the outer lateral part of the mobile crankshaft outer (5).

Figure 2.1 and 2.2 is a schematic view of a motor shaft for two-stroke engines equipped with the device, according to the invention, with the axial motion of the mobile crankshaft outer (5) with respect to the rotation of the motor shaft whose feature is to have the command of the movement in the same phase of expansion and compression generated by a track (13) recessed in the outer part of the mobile crankshaft outer (5) and whose movement is generated by the presence of one or more cams (12) and the fulcrum of which is integral with the outer casing (3) of the motor shaft so as to oblige the reciprocating axial motion of the mobile crankshaft outer (5) during the rotation of the motor shaft according to the track (12) .

Figure 3.1 and 3.2 is a schematic view of a motor shaft for two-stroke engines equipped with the device, according to the invention, with the axial motion of the mobile crankshaft outer (5) with respect to the rotation of the motor shaft whose feature is to have the command of the movement in the same phase of expansion and compression is controlled by a track (15) in relief on the outside of the mobile crankshaft outer (5) and whose movement is generated by the presence of two or more cams (14) pivoted in the crankcase (3) laterally to the track (15) in relief and in contact with the same so as to force its movement.

Figure 4.1 and 4.2 is a schematic view of a crankshaft assy for two-stroke engines equipped with the device, according to the invention, with axial motion of the mobile crankshaft outer (5) with respect to the rotation of the motor shaft whose feature is to have the command of generated in the same movement phase of expansion from the connecting rod (1) by means of cams (8) present on the head of the connecting rod (1) and in the compression phase by one or more springs (17) set between the fixed crankshaft outer (6) of the crankshaft and the mobile crankshaft outer (5) .

With reference to Figure 1 is described a variable volume crankshaft assy consisting of a connecting rod (1) made integral with the fixed crankshaft outer RH or LH (6), by a mating pin (4) and this shaft has the feature of having two mobile fixed crankshaft outer (5) that with axial motion with respect to the rotation shaft of the motor itself and cylindrical in shape, cover the fixed crankshaft outer (6) having a hole in correspondence with the mating pin (4) of the connecting rod (1) set on a bearing or brass (7) thereby preventing the mobile crankshaft outer (5) to turn freely on the fixed crankshaft outer (6) but making it integral with the fixed crankshaft outer (6) and then timed with the rotation of the crankshaft outer, and then allowing the mobile crankshaft outer (5) only an axial reciprocating motion which can be generated in various ways such as by the attached claims.

With the aid of the figures 1.1,1.2,2.1,2.2,3.1,3.2,4.1,4.2,5 it will now be briefly described the operation of the variable-volume device associable to the crankshaft assy of the two-stroke engines. The operation of the engine in two-stroke cycle takes place in two phases controlled by the reciprocating movement of the piston, the first phase is the suction of fresh gas and it occurs in the crankcase caused by the ascent of the piston in the cylinder which in turn compresses the mixture in the cylinder and the second one with the expansion of the combustion gases ignited by the spark of the spark plug and fresh gas compression in the crankcase through the descent of the piston, all in a single turn of the crankshaft.

The function of the device, according to the invention, is to increase the volume of air sucked otherwise equal to the displacement by expanding the mobile crankshaft outer (5) with an axial movement on the fixed crankshaft outer (6) during the rising phase of the piston (2) so as to increase the volume of air sucked into the engine crankcase (3) and in the next phase with the closure of the axial moving crankshaft outer (5) is to allow a substantial increase of the pressure inside the crankcase pump motor (3) and accordingly when it opens in the cylinder the light wash or transfer, filling the same with a considerable flow of fresh air proportional to the axial stroke of the mobile crankshaft outer (5) controlled in their movement in various ways.

Although the invention has been described and shown only with reference to a particular embodiment and reference is made to its application on a motor shaft, it will be obvious to a technician that various changes, substitutions and additions of parts with other equivalent functions may be made, without departing from the scope of protection defined by the following claims; for example the system of axial actuation of the mobile crankshaft outer (5) which will adapt to the engine casing and the crankshaft assy.