United States Patent [19]

Lippitsch

[11] **3,926,157**

[45] **Dec. 16, 1975**

[54] **TWO-CYCLE ENGINE WITH INLET PORTING BY ROTARY VALVE**

[75] Inventor: **Hans Heinz Lippitsch,** Gunskirchen, Austria

[73] Assignee: **Bombardier Limited,** Valcour, Quebec, Canada

[22] Filed: **Oct. 12, 1973**

[21] Appl. No.: **405,864**

[52] **U.S. Cl.**..... **123/73 D;** 123/41.47; 123/190 D; 123/198 C; 123/73 R

[51] **Int. Cl.**[2] **F01L 7/12**

[58] **Field of Search**..... 123/73 D, 73 R, 190 D, 123/198 C, 80 D, 81 D, 41.46, 41.47, 195 A

[56] **References Cited**

UNITED STATES PATENTS

914,366	3/1909	Willet	123/73 D
1,277,742	9/1918	Mummert	123/41.47

FOREIGN PATENTS OR APPLICATIONS

1,178,639	9/1964	Germany	123/41.46
530,806	7/1955	Italy	123/190 D
1,291,813	4/1961	France	123/73 D

OTHER PUBLICATIONS

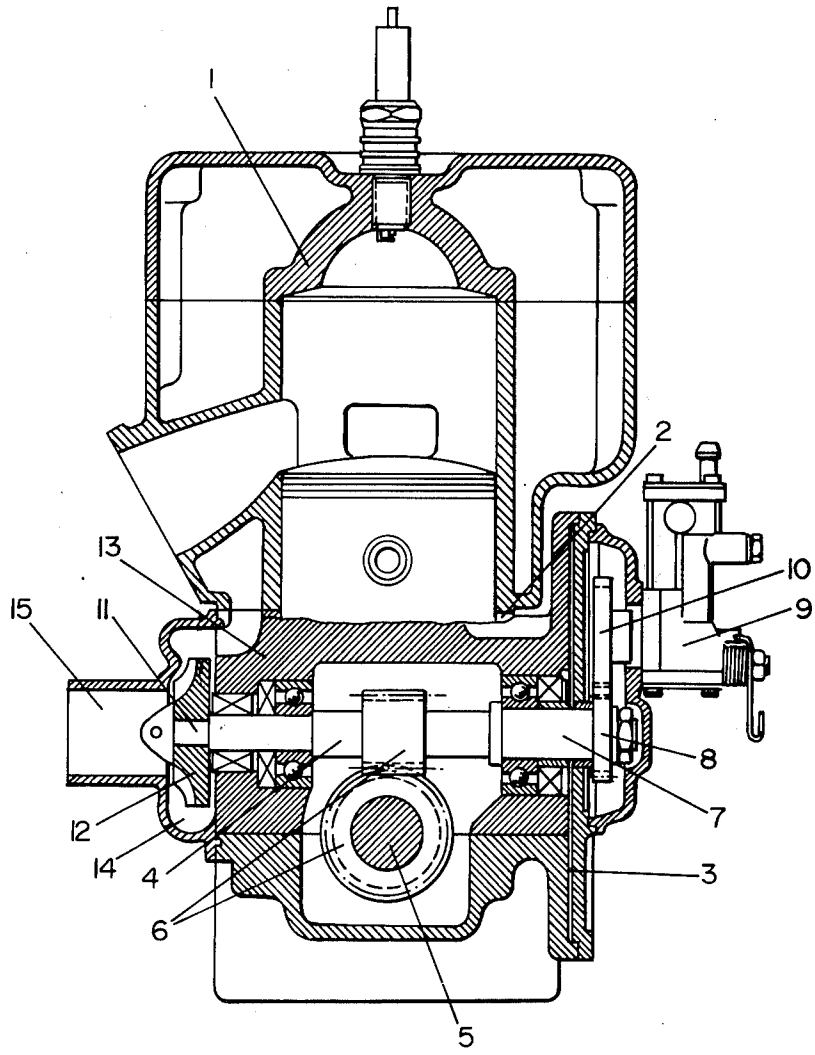
Motorcycle Repair Manual, p. 193, Figure No. 5, Petersen Publishing Company, 1972.

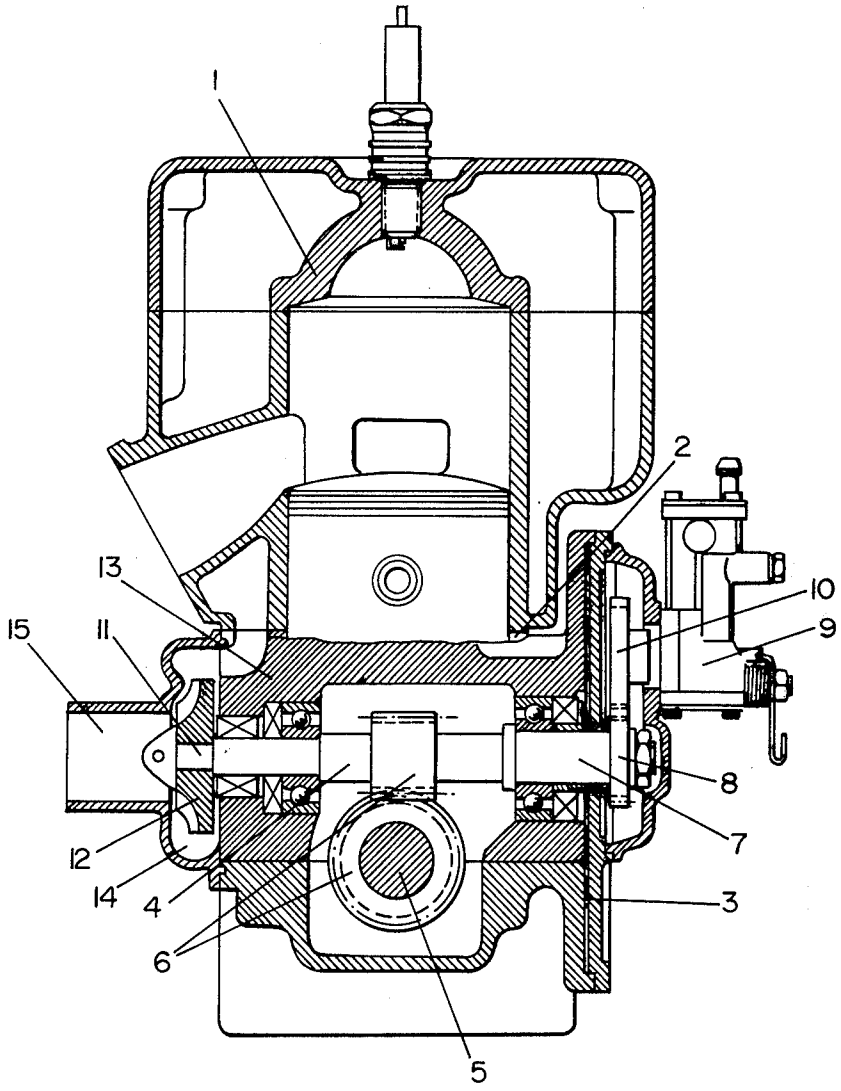
Primary Examiner—Wendell E. Burns
Assistant Examiner—David D. Reynolds

[57] **ABSTRACT**

A two-cycle engine with rotary valve induction control, has a rotary valve drive shaft connected to the crankshaft through a worm gear and also drives additional auxiliary and accessory systems such as the engine oil pump and water pump. With conventional arrangements it is difficult to provide for the drive of all necessary auxiliary and accessory systems directly from the ends of the crankshaft.

1 Claim, 1 Drawing Figure




1
2
13
15
11
10
9
8
7
12
14
4
6
3
5

TWO-CYCLE ENGINE WITH INLET PORTING BY ROTARY VALVE

FIELD OF THE INVENTION

The invention relates to a two-cycle engine with rotary valve induction control for the crankcase breathing, the rotary disc valve being mounted on its own drive shaft that is driven by gearing, preferably spiral gearing from the crankshaft.

DESCRIPTION OF THE PRIOR ART

Using such an arrangement of the rotary valve on its own drive shaft, both ends of the crankshaft can be kept free for the drive shafts and outputs that are needed to drive auxiliary assemblies and accessories. The large number of accessories, such as generators, magnetoes, fans, oil pumps and the like, that are required for an engine make it practically impossible to take all the drives and auxiliary drives directly from the free ends of the crankshaft. In the case of water-cooled engines, that are being built today in ever-increasing numbers, it becomes extremely difficult to manage without intermediate gearing for the outputs, since, in addition to the auxiliary assemblies and accessories mentioned above, there is also the water pump to be considered. However, the requirement for intermediate gearing at the centre of the crankshaft entails more complicated and costly construction and a greater power loss and this, of course, has to be avoided at all costs.

The aim of the invention is the elimination of these shortcomings and the creation of a two-cycle engine of the kind described above which, despite its simple construction, avoids taking off power for driving auxiliary assemblies directly from the ends of the crankshaft without the use of any intermediate gearing, so that one of them can be kept free for the output.

SUMMARY OF THE INVENTION

In the main, the invention solves this task by the fact that auxiliary and accessory systems, especially an oil pump and a water pump, are additionally connected to and driven by the rotary valve drive shaft. By using the rotary valve drive shaft for driving, for example, an oil pump and a water pump, it becomes simpler to attach the other auxiliary drives to the crankshaft since nothing but the actual power output and the reduced number of auxiliary drives are connected to the free ends of the crankshaft and the design problems are reduced by the reduced number of auxiliary drives.

It is especially advantageous when a pinion is arranged on the rotary valve end of the drive shaft, and this pinion engages with a driving gear that is supported on the pump shaft of an oil pump. Thus one end of the rotary valve drive shaft is not used solely for driving the rotary valve itself, but is also used to drive the oil pump, thereby ensuring power for an auxiliary assembly without any special expense and without making any demand on a free end of the crankshaft. The pinion can also double as a hub for the rotary valve, which must be fixed in relation to the shaft, the rotary valve and the pump drive gear being mounted so as to float on the pinion.

In order that a water pump can also be driven by the rotary valve drive shaft, according to a preferred feature of the invention, the end of the drive shaft furthest removed from the rotary valve bears the water pump impeller. Thus, it is possible to use one or both ends of the drive shaft for driving auxiliary assemblies such as an oil and a water pump, so that not all the auxiliary systems must be in direct connection with the crankshaft and the rotary valve drive shaft can be more efficiently exploited.

BRIEF DESCRIPTION OF THE DRAWING

One embodiment of the invention is shown in the accompanying drawing which is a cross-sectional view of a two-cycle engine.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The two-cycle engine **1** is controlled by rotary valve, the inlet **2** for the crankcase being periodically opened and closed by means of the rotary valve **3.** The rotary valve **3** is mounted on its own drive shaft **4** which is connected to the crankshaft **5** through a worm or spiral gearing **6,** so that the rotary valve **3** is rotated by the crankshaft. At the end **7** of the drive shaft **4** that carries the rotary valve there is a pinion **8** that meshes with a drive gear **10** which operates an oil pump **9.** At the end **11** of the drive shaft that is furthest removed from the rotary valve there is an impeller **12** for a water pump that consists in the main of this impeller **12** and a suitable annular housing **14** that is flange-mounted on the crankcase **13.**

In accordance with the invention, the rotary valve drive shaft **4** serves not only to drive the rotary valve **3,** but is used at the same time to drive an oil pump and a water pump, whereby the number of auxiliaries that are to be driven directly from the crankshaft is reduced and the construction of the engine and the support for the crankshaft both become simpler. The pumps that are connected to the free ends **7, 11,** of the rotary valve drive shaft can be easily mounted there or on the engine housing. Above all else, the water pump, with its impeller **12** mounted directly on the end **11** of the shaft, can be mounted in accordance with requirements since the inlet pipe **15** can enter not only from the outside, as is shown in the drawing, but can also enter from the crankcase, in which case it will only be necessary to mount the impeller in the reverse direction on the shaft. It is of course, possible to provide either individual or combination pumps, or drive other components from the rotary valve drive shaft.

What I claim as my invention is:

1. A two-cycle engine with rotary valve induction control, comprising: an engine casing defining a crankcase; a crankshaft rotatably mounted in said casing to deliver power from said engine; a drive shaft rotatably mounted in said casing transversely of said crankshaft, worm gear means drivingly connecting said crankshaft to said driveshaft; a rotary valve means to control the supply of combustion mixture to said crankcase directly connected to said drive shaft at one end thereof for rotation thereby; at least one additional auxiliary system drivingly connected to the other end of said drive shaft, said at least one additional auxiliary system comprising a liquid coolant circulation pump having a housing which is at least in part integral with said casing and an impeller within said housing directly connected to said other end of said drive shaft for rotation thereby; an oil injection pump in said casing, said oil injection pump being gear driven and including a driven gear; and said rotary valve means including a

hub comprising a driving pinion meshing with said driven gear.

* * * * *