May 12, 1970 F. B. ESTY 3,511,219

AUTOMATIC COMPRESSION RELEASE

Filed Nov. 12, 1968

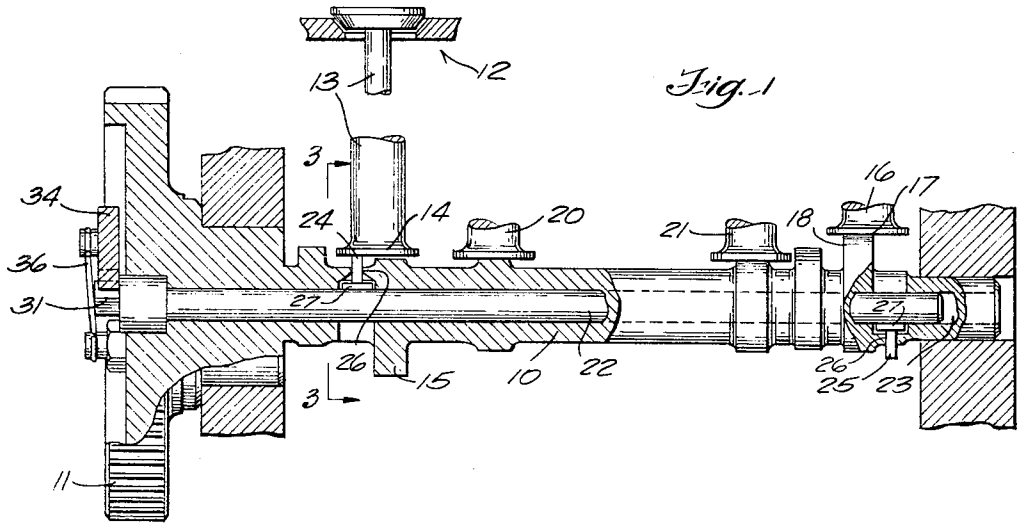


Fig. 1

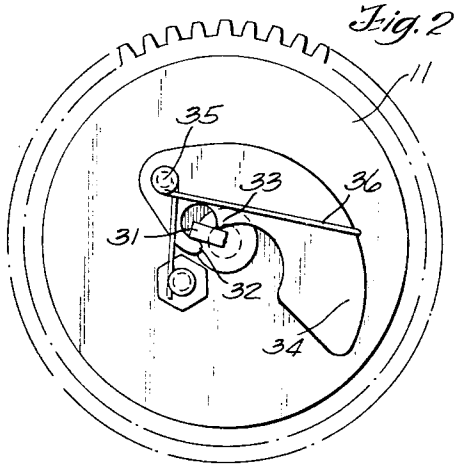


Fig. 2

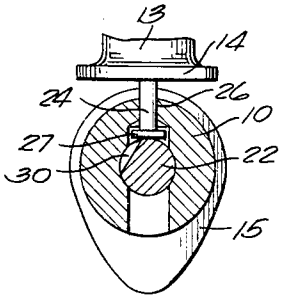


Fig. 3

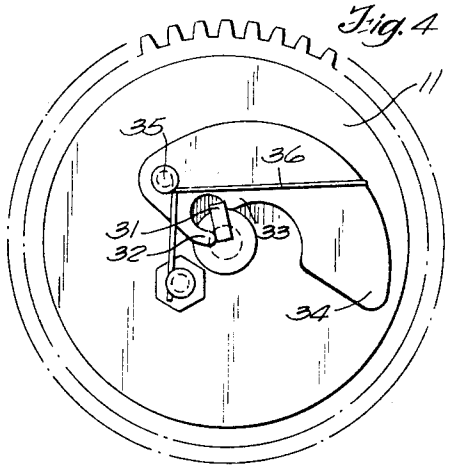


Fig. 4

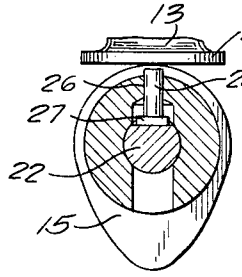


Fig. 5

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AUTOMATIC COMPRESSION RELEASE

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U.S. Cl. 123—182 2 Claims

ABSTRACT OF THE DISCLOSURE

This disclosure relates to an automatic compression release for a multi-cylinder engine. A single, centrifugally actuated flyweight turns a rotor co-axially within a hollow cam shaft. The rotor has cam means proximate certain cams on the shaft which actuate tappers for certain valves. There are radially movable push pins for each such tapper, the pins being actuated by the cams on the rotor, to simultaneously provide compression release for all cylinders at low engine speeds and normal compression at high engine speeds.

BACKGROUND OF THE INVENTION

My U.S. Pat. 3,362,390 shows an automatic compression release best adapted for incorporation into single cylinder engine. The present invention extends the principle of my prior patent to multi-cylinder engines.

SUMMARY OF THE INVENTION

In accordance with the present invention, mechanism is provided to transmit the turning moment of a centrifugally actuated flyweight to concurrently influence the tappers for a valve of each cylinder of a multi-cylinder engine. The flyweight is in motion transmitting connection to a rotor or shaft co-axial within a hollow cam shaft. Proximate each cam for the tapper of each such valve, there is a radially movable push pin, and cam means on the rotor for each pin. Accordingly, all push pins are moved simultaneously when the flyweight turns the rotor in response to changes in engine speed.

The disposition of the rotor shaft co-axially within the cam shaft provides for opening each such valve the same amount, under control of a single flyweight. The motion transmitting parts are completely housed within the cam shaft and are not exposed to possible damage and do not interfere with the functioning of other parts of the engine.

Other objects, features, and advantages of the invention will appear from the following disclosure.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary cross section through the cam shaft and associated cams and tappers of a multi-cylinder combustion engine. An exhaust valve and its seat are also shown in reduced scale.

FIG. 2 is an end view of the cam shaft driving gear with flyweight mounted thereon. In this view the engine is at rest or is turning at low speed, such as during cranking and at which time the compression release is effective.

FIG. 3 is a cross section taken along the line 3—3 of FIG. 2, the parts being shown in low speed position.

FIG. 4 is a view similar to FIG. 2 but showing the high speed position in which the flyweight is moved centrifugally outwardly to automatically de-actuate the compression release.

FIG. 5 is a cross section similar to FIG. 3, but illustrating the parts in high speed position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Although the disclosure hereof is detailed and exact to enable those skilled in the art to practice the invention, the physical embodiments herein disclosed merely exemplify the invention which may be embodied in other specific structure. The scope of the invention is defined in the claims appended hereto.

The function and purpose of the present invention are comparable to those stated in my prior patent aforesaid. FIG. 1 illustrates, for purposes of exemplification, a two-cylinder engine. The invention is applicable to any multi-cylinder engine, regardless of the number of cylinders. Cam shaft **10** is driven by gear **11**. A typical exhaust valve for one of the cylinders is shown in reduced scale at **12**. This valve has a stem **13** having at its lower end a tapper or pad **14** which conventionally is spring pressed against cam **15** on the shaft **10**. The stem **16** with tapper **17** of another exhaust valve of a second cylinder of the engine is shown near the right hand end of FIG. 1. Tapper **17** is spring pressed against cam **18**. The valve stems **20**, **21** are for the intake valves of the engine cylinders. Their action is not affected by the invention.

Compression release mechanism is provided for each of the exhaust valve tappers **14**, **17**. This mechanism comprises a shaft or rotor **22** which is disposed co-axially within a hollow bore **23** of cam shaft **10**, and rotates therewith. Adjacent the respective cams **15**, **18** are radially movable push pins **24**, **25**, disposed in radial bores **26** formed laterally through one side of the shaft **10**. Each pin has a head **27** aligned with a flat or like cam means **30** formed on the rotor shaft **22**.

The end of the rotor shaft **22** is provided with a crankarm **31** which is embraced by the fingers **32**, **33** of centrifugal flyweight **34**. Flyweight **34** is pivotally connected to the plate or gear **11** on a pintle **35**. The flyweight **34** has a spring **36** which biases the weight toward the center of rotation of the gear **11**, but which will yield under centrifugal force as the speed of the engine rises. At low speed, for example, any speed below about 650 r.p.m., the flyweight **34** will be in its position shown in FIG. 2 in which the cam flats **30** on the rotor **22** are turned away from the heads **27** of the pins **24**. Accordingly the pins are lifted on the periphery of the shaft **22** to project to their maximum extent. The tappers **14**, **17** will ride on the projected pins **24**, thus to keep the exhaust valves slightly open during starting of the engine and effectuate compression release.

As engine speed increases above a predetermined speed, such as, 650 r.p.m., centrifugal force will turn the weight **34** outwardly about pintle **35** and against the pressure of spring **36** to its position shown in FIG. 4, whereupon the fingers **32**, **33** will act on the crankarm **31** of the rotor shaft **22** to turn the rotor shaft to its position shown in FIGS. 4 and 5. The pins **24**, **25** may now retract under the pressure of the tappers **14**, **17** into the space above the cam flats **30**, thus to permit the exhaust valves to close completely during the charging cycle of the engine.

The push pins for both tappers **14**, **17** will be actuated simultaneously to effectuate equal compression release for all cylinders at low speeds and to de-actuate the compression release for all cylinders simultaneously at higher speeds. A single rotor turning mechanism comprising the

centrifugal weight **34**, etc., turns the rotor **22**. By mounting the rotor **22** within the hollow cam shaft, it is out of the way of other engine apparatus.

It is claimed:

1. In a multi-cylinder engine having a cam shaft, cams and tappers actuated by said cams, the improvement in an automatic compression release which acts concurrently on a tapper for each cylinder and comprising:

said cam shaft being hollow and having co-axially therewithin a rotor which extends along the cam shaft into proximity to the cam for each said tapper,

radially movable push pins mounted in said cam shaft and cooperating with each said tapper,

cam means on said rotor for actuating each said push pin, and

rotor turning mechanism responsive to engine speed for concurrently actuating each said push pin.

2. The engine of claim **1** in which said rotor turning mechanism comprises a single centrifugal flyweight.

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