

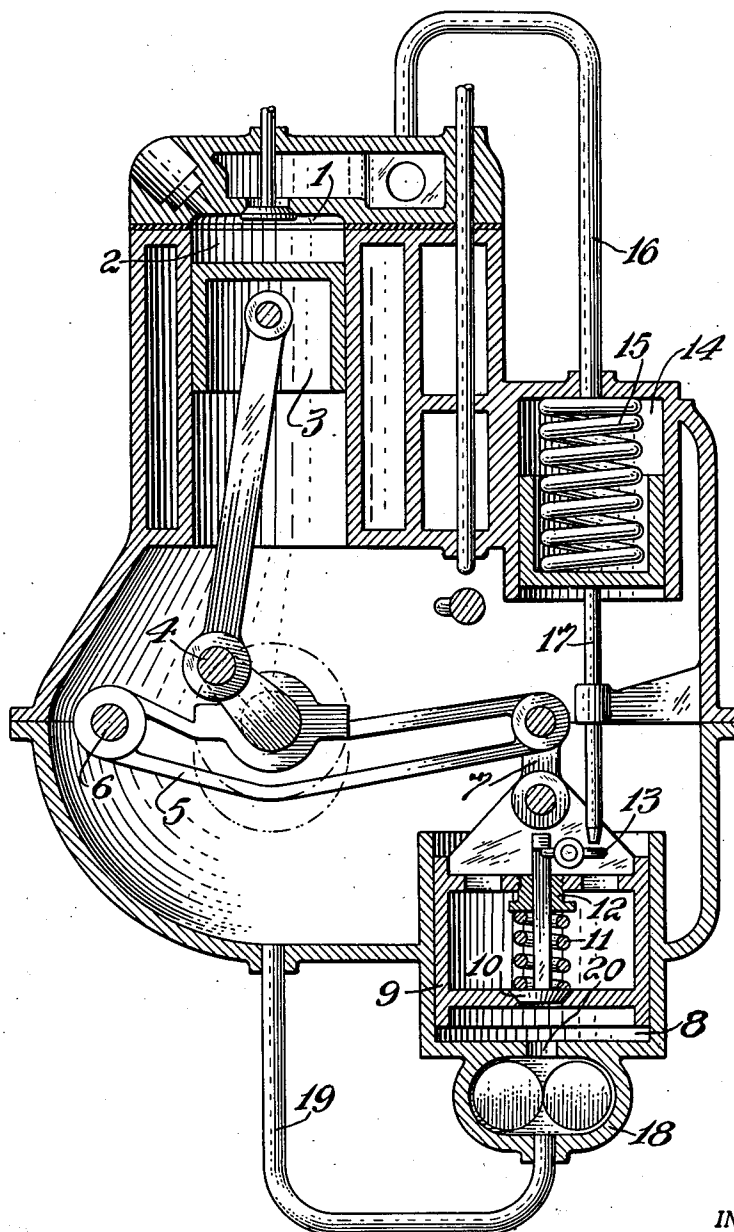
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VARIABLE COMPRESSION RATIO INTERNAL-COMBUSTION ENGINE

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VARIABLE COMPRESSION RATIO INTERNAL-COMBUSTION ENGINE

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2 Claims. (Cl. 123-48)

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This invention relates to a variable compression ratio internal combustion engine, and more particularly to a control system for varying the compression ratio of a cylinder and piston type internal combustion engine.

Such control systems have already been proposed but have not proved practical. The prime object of my invention is, therefore, to generally improve control systems of the kind referred to.

In one type of prior construction, hydraulic means are used for varying the relative position of the crankshaft of an internal combustion engine. However, this prior construction provides for a hydraulic jack and auxiliary means to be disposed outside the crankcase, thus complicating the mechanism considerably. An important object of my invention is to provide hydraulic means of a greatly simplified design.

To the accomplishment of the foregoing objects and such other objects as will hereinafter appear, my invention consists in a control system for the ratio of compression of internal combustion engines, the elements of this control system and their relation one to the other, as hereinafter are more particularly described in the specification and sought to be defined in the claims. The specification is accompanied by a drawing illustrating an engine according to my invention.

Referring now to the drawing, 1 is the combustion chamber of the motor cylinder 2 within which the piston 3 moves up and down. The crank shaft actuating the piston is designated 4. An oscillatingly carried mounting or cradle 5 supporting the crank shaft 4 is pivoted at one of its ends to a shaft 6 carried by the crank case, the purpose of the cradle being to vary the position of the crank shaft relative to the cylinder block. At its other end, the cradle is linked by means of a connecting rod 7 to a hydraulic jack. Within the cylinder 8 of the jack, the plunger 9 is moved by oil pressure. An oil pump 18 of any suitable construction supplies oil from the crank case through the line 19, forcing oil through the orifice 20 into the cylinder 8.

The oil pressure in the cylinder 8 is regulated by a valve 10, which, for instance, may be accommodated in the plunger 9. The stem of the valve 10 is controlled by a lever 13 which is fulcrumed on, and moves with, the plunger 9. The valve 10 is normally held in closed position by a spring 11 that can be adjusted by means of a screw nut 12. The lever 13 is operated by the rod 17 of a vacuum-responsive device 14 which comprises a piston or diaphragm acted upon by a spring 15 and

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the pressure prevailing in the intake manifold of the engine, the intake manifold being in communication with the device 14 through the line 16.

The following is a description of the operation of my control system. The view illustrated in the drawing may be supposed to correspond to a position of equilibrium so that the oil pressure in the cylinder 8 holds the cradle in equilibrium. Upon increasing the speed of the engine, the rod 17 descends and acts on the lever 13 and causes the valve 10 to open, thus increasing the flow of oil and decreasing the pressure in the cylinder 8. The plunger 9 descends and so does the cradle, causing the volume of the compression chambers to increase. The rod 17 will come to a standstill in a position which corresponds to the actual load of the engine while, however, the downward movement of the plunger 9 continues until the lever 13 has assumed the same angular position in relation to the rod 17 as occupied initially. This restores the initial oil pressure and the equilibrium of the cradle.

A reduction of the speed of the engine causes the upward movement of the rod 17 and closes the valve 10 partially or completely. The oil pressure in the cylinder 8 increases, causing the plunger 9 and the cradle to rise, and resulting in a decrease of the volume of the compression chambers. The ascending movement continues until the lever 13 reaches its initial position relative to the rod 17.

When the engine is stopped, both the rod 17 and the plunger 9 of the fluid jack will assume their lowermost positions.

When starting the engine, the rod 17 assumes a position which corresponds to the suction effect prevailing in the intake manifold. The oil pump 18 causes the pressure in the cylinder 8 to rise, thus causing the upward movement of the plunger 9, and consequently reducing the dead space in the motor cylinder, until the lever 13 meets the rod 17 and equilibrium is established.

The novel and improved control system of my present invention and the advantages in the use and operation thereof will, I believe, be fully apparent from the above detailed description thereof. It will be further apparent that many changes may be made without departing from the spirit of the invention as defined in the following claims.

What I claim is:

1. In a cylinder and piston type of internal combustion engine, an intake manifold, a crankshaft, a mounting to vary the position of the crankshaft relative to the cylinder block, a fluid jack to actuate said mounting, means operatively

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connecting said fluid jack with said mounting, a vacuum-responsive device operative from the intake manifold to control the operation of the fluid jack, a system for supplying fluid to the jack, the vacuum-responsive device communicating with the intake manifold and being provided with suction-operable means, the fluid jack having a plunger provided with a valve opening and closing the fluid supply circuit, said plunger being connected to said mounting for elevating and lowering the crankshaft, said valve being normally closed by means of resilient means, a lever fulcrumed on said plunger to control, when actuated, said valve, said suction-operable means actuating said lever, said crankshaft, mounting, fluid jack, means connecting the fluid jack and mounting, and vacuum-responsive device being enclosed within the walls of the cylinder block and the crankcase.

2. In a cylinder and piston type of internal combustion engine, an intake manifold, a crankshaft, a mounting to vary the position of the crankshaft relative to the cylinder block, a fluid jack to actuate said mounting, means operatively connecting said fluid jack with said mounting, a vacuum-responsive device operative from the intake manifold to control the operation of the fluid jack, a system for supplying fluid to the jack, the vacuum-responsive device communi-

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cating with the intake manifold and being provided with suction-operable means, the fluid jack having a plunger provided with a valve opening and closing the fluid supply circuit, said valve being accommodated in the plunger, said plunger being connected to said mounting for elevating and lowering the crankshaft, said valve being normally closed by means of resilient means, a lever fulcrumed on said plunger to control, when actuated, said valve, said suction-operable means actuating said lever, said crankshaft, mounting, fluid jack, means connecting the fluid jack and mounting, and vacuum-responsive device being enclosed within the walls of the cylinder block and the crankcase.

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