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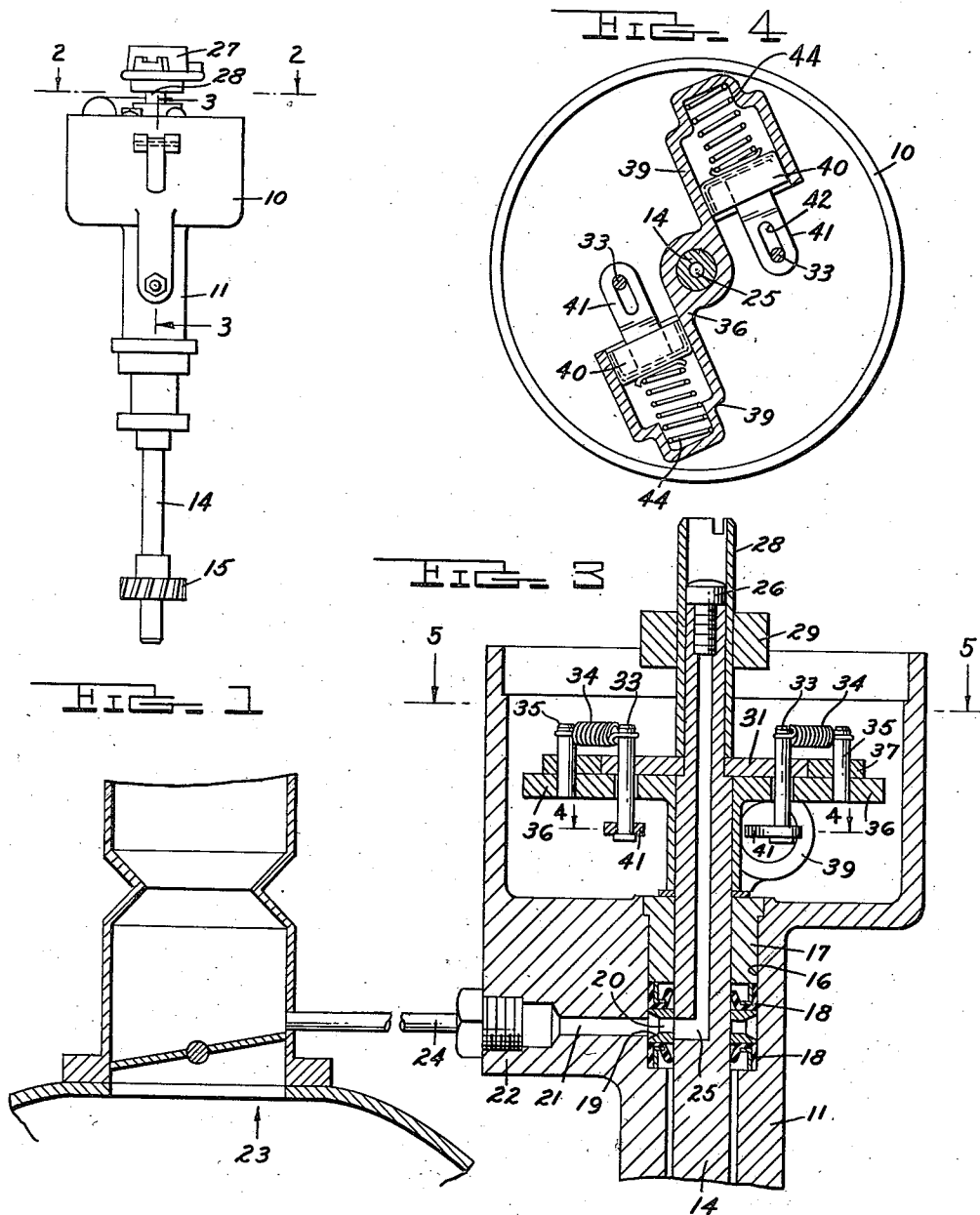
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CENTRIFUGAL VACUUM DISTRIBUTOR

Filed June 21, 1954

2 Sheets-Sheet 1



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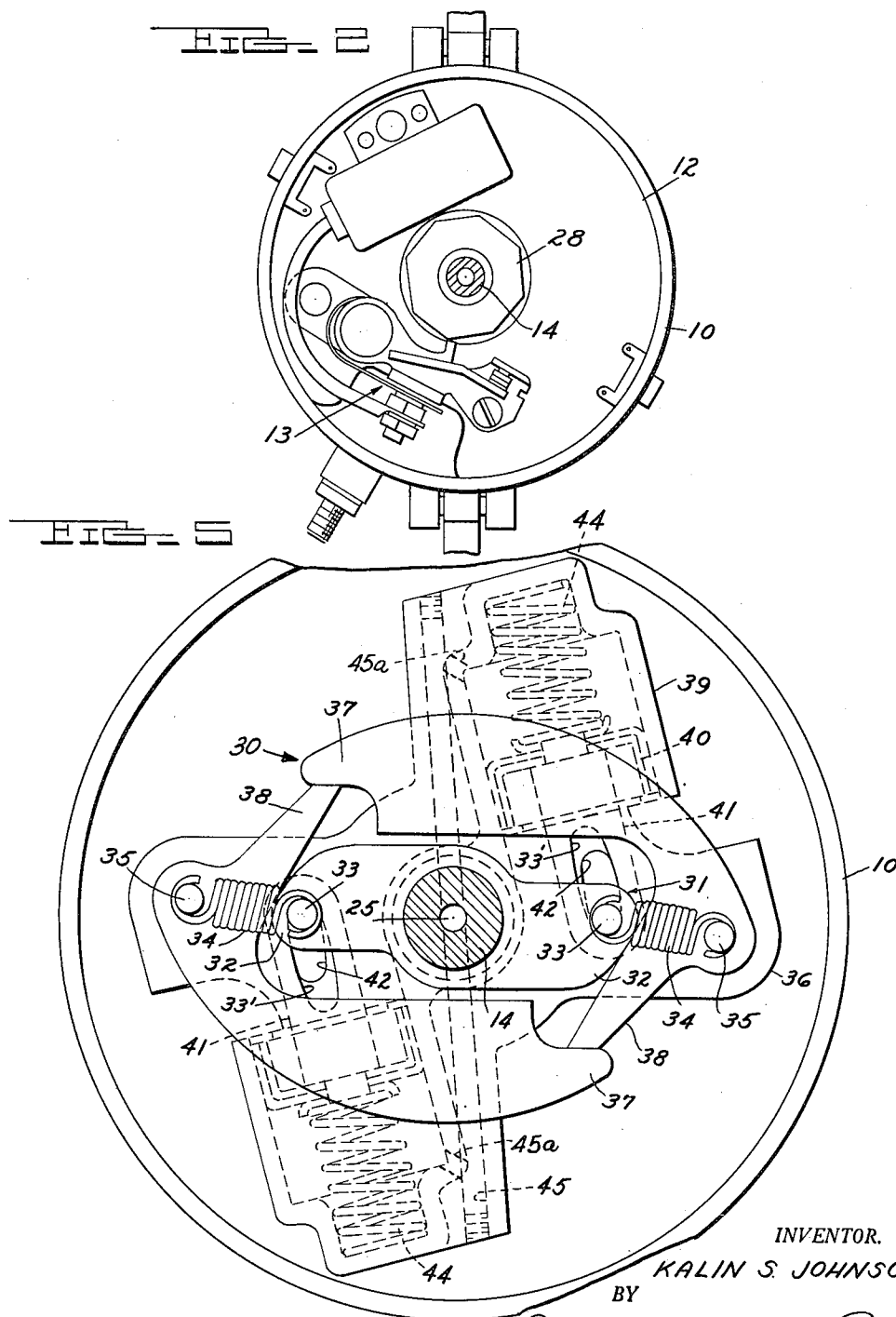
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CENTRIFUGAL VACUUM DISTRIBUTOR

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2 Sheets-Sheet 2



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CENTRIFUGAL VACUUM DISTRIBUTOR

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6 Claims. (Cl. 123—117)

This invention relates generally to ignition timing mechanism of the type used in connection with internal combustion engines.

It is an object of this invention to provide improved mechanism for varying the ignition timing in response to variations in both the speed of the engine and the load imposed on the engine.

It is another object of this invention to provide mechanism of the above type wherein the means for varying the timing in response to the speed of the engine and the means for varying the timing in response to the load imposed on the engine operate independently of one another. Thus, the mechanism may be readily calibrated to meet the requirements at different operating conditions of the engine.

The foregoing as well as other objects will be made more apparent as this description proceeds especially when considered in connection with the accompanying drawings, wherein:

Figure 1 is an elevational view of a timing device embodying the features of this invention;

Figure 2 is a sectional view taken on the line 2—2 of Figure 1;

Figure 3 is a fragmentary longitudinal sectional view of the timing device having certain parts removed for the sake of clearness;

Figure 4 is a sectional view taken on the line 4—4 of Figure 3; and

Figure 5 is a sectional view taken on the line 5—5 of Figure 3.

The ignition device selected herein for the purpose of illustrating the present invention comprises an upwardly opening substantially cup-shaped housing 10 having a tubular shank portion 11 depending from the bottom wall thereof. The upper end of the housing is closed by a plate 12 which serves as a support for the usual circuit interrupter mechanism indicated in Figure 2 of the drawings by the numeral 13.

Journalled in the shank 11 for rotation is a drive shaft 14 having the upper end projecting through the housing 10 and having a pinion 15 secured to the lower end for connecting the drive shaft to the engine. As shown in Figure 3 of the drawings, the upper end of the shank 11 is counterbored as at 16 to receive a bearing 17 for the drive shaft 14 and to accommodate a pair of axially spaced seals 18. A spacer 19 is interposed between the seals and is provided with a port 20 which registers with a passage 21 formed in an enlargement 22 of the shank 11.

The passage 21 is connected to the body of the carburetor by a conduit 24 and communicated to the engine intake manifold through the carburetor bore in such a manner that the throttle valve acts to admit manifold suction to passage 21 at all engine conditions other than idle. The port 20 in the spacer 19 also registers with a passage 25 which extends axially of the drive shaft 14 to the upper end of the latter and is closed by a plug 26. As will be more fully hereinafter described the passage 25 is con-

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nected to the means for varying the timing device in accordance with the load imposed on the engine.

A rotor 27 to distribute the high tension sparks is secured to the upper end of a tubular driven shaft 28 having the lower end telescopically engaging the upper end of the drive shaft 14 in a manner such that the driven shaft 28 is capable of rotation relative to the drive shaft 14. The circuit breaker 13 previously described is operated by a cam 29 which is secured to the driven shaft 28 below the rotor 27. The driven shaft 28 is rotated by the drive shaft 14 through the medium of mechanism 30 which establishes an operative connection between the two shafts.

As shown in Figure 5 of the drawings, the mechanism 30 comprises a cam 31 secured at its center to the lower end of the driven shaft 28 and having cam portions 32 diametrically opposed with respect to the axis of the driven shaft 28. Suitable pins 33 respectively extend vertically through openings in the cam portions 32 and are secured to the latter portions. The upper ends of the pins 33 are respectively connected to the inner ends of springs 34 having the outer ends anchored on vertically extending pins 35. The pins 35 are fixed to and extend upwardly from a plate 36 which is located within the housing 10 adjacent the bottom of the latter to rotate as a unit with the drive shaft 14. The plate 36 has slots 33' therethrough for respectively receiving the pins 33 and the latter engage the tracking ends of the slots 33' to drive the cam 31 from the plate 36.

A pair of weights in the form of arms 37 are positioned in symmetrical relationship at opposite sides of the cam 32 in the plane of the latter and the opposite or outer ends of the arms 37 are respectively pivotally mounted on the pins 35. The outer or pivoted end of each arm 37 has a projection 38 which extends toward the free end of the other arm and forms a stop to limit inward swinging movement of the arms 37 about the pins 35. As shown in Figure 5 of the drawings, the projections 38 respectively abut the extremities of the cam portions 32 which are shaped to have a rolling contact with the projections 38.

The above structure is such that outward swinging movement of the arms 37 by the centrifugal force developed as a result of rotation of the plate by the drive shaft 14, causes the projections 38 to rotate the cam 31 and driven shaft 28 relative to the drive shaft 14 in a direction to advance the timing cam 29. The slots 33' in the plate 36 for receiving the pins 33 are of sufficient length to permit substantial advancement of the cam 31 relative to the plate 36. Since the arms 37 or weights are driven by the shaft 14 which, in turn, is driven by the engine, it follows that the timing mechanism is varied in response to the speed of the engine. The centrifugal force required to swing the arms or weights 37 outwardly depends on the strength of the springs 34, and these springs may be readily interchanged with springs of different strength to enable varying the operating characteristics of the timing mechanism.

Also carried by the plate 36 at the under side of the latter is a pair of cylinders 39 having pistons 40 slidably supported therein. The cylinders 39 are symmetrically arranged with respect to the axis of the drive shaft 14 and the inner ends of the cylinders are open for respectively receiving links 41. The outer ends of the links are respectively fixed to the pistons 40 and the inner ends of the links are slotted as at 42 for respectively receiving the lower ends of the pins 33. The slots 42 are of a length to permit rotation of the cam 31 relative to the drive shaft 14 by the weights or arms 37 independently of the links 41 and pistons 40.

The pistons 40 are normally urged to their innermost positions in the cylinders 39 by springs 44 respec-

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tively located within the cylinders 39 at the outer ends of the pistons 40. When the pistons 40 are in their innermost positions in the cylinders 39, the pins 33 respectively engage the extremities of the slots 42 remote from the inner ends of the cylinders so that outward movement of the pistons 40 in the respective cylinders 39 against the action of the springs 44 imparts a rotative movement to the cam 31 relative to the drive shaft 14 in a direction to advance the timing cam 29. The spaces within the cylinders 39 at the outer ends of the pistons 40 communicate with the suction passage 25 in the drive shaft 14 through a transverse passage 45 and branch passages 45a formed in the plate 36.

The subatmospheric pressure existing in the cylinders 39 at the outer ends of the pistons 40 approximates the subatmospheric pressure in the intake manifold 23 and, when this subatmospheric pressure drops sufficiently to overcome the action of the springs 34 and 44, the pistons 40 move outwardly in their respective cylinders 39 to advance the timing cam 29, as stated above. The pistons 40 and associated parts function to rotate the cam 29 relative to the drive shaft 14 independently of the weights or arms 37. The manifold pressure is a function of the load imposed on the engine so that the timing cam 29 is rotated relative to the drive shaft 14 in response to variations in the load. The action of the pistons 40 to rotate the timing cam 29 relative to the drive shaft may be varied without affecting the action of the weights or arms 37 to rotate the timing cam by merely interchanging the springs 44 with springs of different strength.

What I claim as my invention is:

1. Ignition timer structure for an internal combustion engine comprising a drive shaft, a timer cam shaft coaxial with said drive shaft, speed and vacuum responsive coupling means connecting said shafts comprising a plate rigidly connected to said drive shaft, a coupling cam rigidly secured to said cam shaft and disposed on said plate, speed responsive arms pivoted to said plate and engaging said cam, spring means connecting said plate and arms to oppose movement of said arms by centrifugal force, said plate having slots therethrough at opposite sides of the axis of said shafts, pins on said cam extending through said slots, and vacuum responsive means carried by said plate and connected to said pins.

2. Ignition timer structure for an internal combustion engine comprising a drive shaft, a timer cam shaft coaxial with said drive shaft, speed and vacuum responsive coupling means connecting said shafts comprising a plate rigidly connected to said drive shaft, a coupling cam rigidly secured to said cam shaft and disposed on said plate, speed responsive arms pivoted to said plate and engaging said cam, spring means connecting said plate and arms to oppose movement of said arms by centrifugal force, said plate having slots therethrough at opposite sides of the axis of said shafts, pins on said cam extending through said slots, vacuum responsive means carried by said plate, and lost motion means connecting said vacuum responsive means to said pins.

3. Ignition timer structure for an internal combustion engine comprising a drive shaft, a timer cam shaft coaxial with said drive shaft, speed and vacuum responsive coupling means connecting said shafts comprising a plate rigidly connected to said drive shaft, a coupling cam rigidly secured to said cam shaft and disposed on said plate, speed responsive arms pivoted to said plate and engaging said cam, spring means connecting said plate and arms to oppose movement of said arms by centrifugal force, said plate having slots therethrough at opposite

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sides of the axis of said shafts, pins on said cam extending through said slots, vacuum responsive means carried by said plate, and lost motion means connecting said vacuum responsive means to said pins, said vacuum responsive means comprising a pair of piston and cylinder devices symmetrically disposed at opposite sides of the axis of said shafts.

4. Ignition timer structure for an internal combustion engine comprising a drive shaft, a timer cam shaft coaxial with said drive shaft, speed and vacuum responsive coupling means connecting said shafts comprising a plate rigidly connected to said drive shaft, a coupling cam rigidly secured to said cam shaft and disposed on said plate, speed responsive arms pivoted to said plate and engaging said cam, spring means connecting said plate and arms to oppose movement of said arms by centrifugal force, said plate having slots therethrough at opposite sides of the axis of said shafts, pins on said cam extending through said slots, vacuum responsive means carried by said plate, and lost motion means connecting said vacuum responsive means to said pins, said vacuum responsive means comprising a pair of piston and cylinder devices symmetrically disposed at opposite sides of the axis of said shafts, said piston and cylinder devices each including spring means independent of the spring means connected to said arms opposing relative movement between the cylinders and their respective pistons in response to increase in vacuum.

5. Ignition timer structure for an internal combustion engine comprising a drive shaft, a timer cam shaft coaxial with said drive shaft, speed and vacuum responsive coupling means connecting said shafts comprising a plate rigidly connected to said drive shaft, a coupling cam rigidly secured to said cam shaft and disposed on said plate, speed responsive arms pivoted to said plate and engaging said cam, spring means connecting said plate and arms to oppose movement of said arms by centrifugal force, a first member fixedly carried by said plate, a second member movable relative to said member in response to variations in engine manifold vacuum, separate spring means opposing relative movement between said members, and lost motion means connecting said second member to said coupling cam.

6. Ignition timer structure for an internal combustion engine comprising a drive shaft, a timer cam shaft coaxial with said drive shaft, speed and vacuum responsive coupling means connecting said shafts comprising a plate rigidly connected to said drive shaft, a coupling cam rigidly secured to said cam shaft and disposed on said plate, speed responsive arms pivoted to said plate and engaging said cam, spring means connecting said plate and arms to oppose movement of said arms by centrifugal force, sealed vacuum responsive means comprising a first member fixedly carried by said plate, a second member movable relative to said member in response to variations in engine manifold vacuum, separate spring means opposing relative movement between said members, and lost motion means connecting said second member to said coupling cam.

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