Jan. 18, 1955 E. A. VOGEL 2,699,657

SPARK ADVANCE CONTROL MECHANISM

Filed Oct. 6, 1950

Fig. 1.

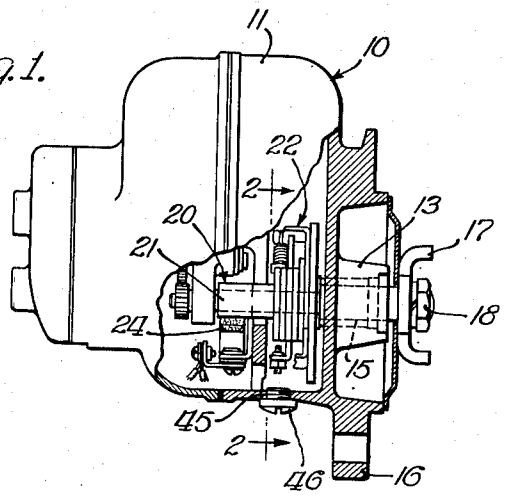


Fig. 2.

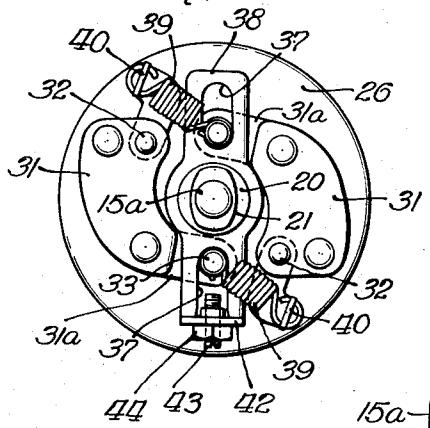


Fig. 3.

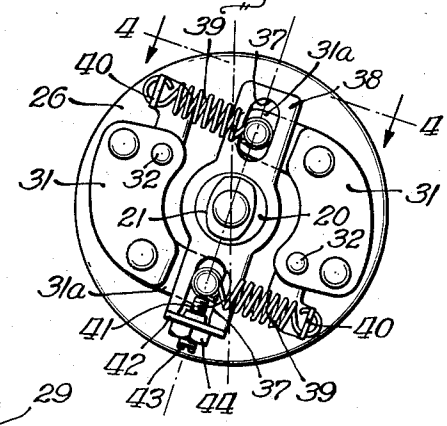
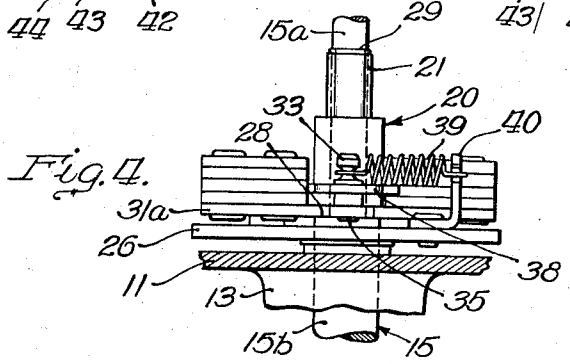


Fig. 4.



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SPARK ADVANCE CONTROL MECHANISM

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1 Claim. (Cl. 64—25)

This invention relates to improvements in a spark advance control mechanism. More particularly, it has to do with improved means for varying the range of spark advance of an ignition timing mechanism that is responsive to the speed of the engine.

In a well known type of ignition timing device, a centrifugal mechanism is employed to couple a driving shaft with a circuit breaker ca min such a manner that the cam will be driven with the driving shaft, while the angular relation between the cam and the shaft will be altered through a predetermined range in accordance with variations in the speed of rotation of the shaft. For best performance, different engine installations require different ranges of spark advance from engine idling speed to operating speed. It is desirable, therefore, that some provision be made for varying the range of spark advance to accommodate different engines.

It is an important object of the present invention to provide convenient means to easily adjust the maximum range of ignition spark advance.

Another object of this invention is to provide an enclosed ignition control mechanism including a casing having an access hole through which the mechanism may be conveniently adjusted.

According to the teachings of the present invention, a novel spark advance governor is provided which includes a pair of weights pivotally mounted on a rotat able base plate, and a control lever connected to a camshaft which is mounted for rotation about the axis of the base plate. Upright pins are secured to the free ends of the pivotable weights and arranged to engage in elongated, radially extending slots in the control lever to rotate the control lever and the camshaft relative to the base plate as the weights are pivoted due to centrifugal force occasioned by rotation of the base plate. Thus as the speed of the engine-driven base plate increases, the pins are moved radially outwardly in the slots of the control lever to advance the circuit breaker cam, the length of the slot determining the range of spark advance. In the arrangement indicated, an adjustable screw is threaded into an upstanding ear at one end of the control arm, the inner-end of the screw extending out over the adjacent slot to define the effective length of the slot and limit the outward movement of the pin therein. Moreover, the governor casing has an access port with a removable cover adjacent the head of the adjustable screw. When the cover is removed, a screwdriver can be inserted through the port for adjusting the screw.

A spring is connected between each pivoting weight and the base plate to yieldingly resist the advancing of the cam.

Other and further features, objects, and advantages of the present invention will be apparent to one skilled in the art from the following detailed description taken in connection with the accompanying drawings.

On the drawings:

Figure 1 is a side elevational view, partly broken away and partly in section, of an ignition device incorporating a spark advance mechanism constructed in accordance with the teaching of the present invention.

Figure 2 is a vertical sectional view taken on line 2—2 of Figure 1.

Figure 3 is a vertical sectional view, similar to Figure 2, and showing a rotated position of the control mechanism.

Figure 4 is a fragmentary side elevational view taken on line 4—4 of Figure 3.

As shown on the drawings:

In Figure 1, the reference numeral **10** indicates an ignition device which has a three piece, separable casing **11**. One section of the casing is provided with a hub **13** in which a drive shaft **15** is journalled. A flange **16** provides means for mounting the device on an engine (not shown). The shaft **15** is driven from the engine through a clutch element **17** which is keyed to the shaft in any suitable manner and held thereon by a nut **18**. Near its opposite end, the shaft **15** is connected in driving relation to a cam sleeve **20** through a centrifugal control mechanism **22**. A two-lobe camming surface **21** of the cam sleeve **20** is movable against a breaker-arm **24** which is effective to interrupt the primary circuit of the ignition system in a manner well known in the art.

As best seen in Figure 4, the drive shaft **15** has a driving portion **15***a* of a smaller diameter than an engine driven portion **15***b* which is journalled in the hub **13**. The driven portion **15***b* passes through and is rigidly secured, as by a press fit, in a central aperture in a circular support plate **26**. Thus, rotation of the shaft **15** will cause rotation of the support plate **26**.

The cam sleeve **20** is disposed in free, close-fitting engagement over the driving portion **15***a* of the shaft **15** so that it may be rotated about the axis of the shaft. One end of the sleeve **20** abuts an annular shoulder **28**, Figure 4, that is formed at the junction of the shaft portions **15***a* and **15***b*, while the other end of the sleeve is engaged by a spring clip **29** which is disposed in a suitable groove in the shaft **15**.

The centrifugal control mechanism **22** is made up of a pair of laminated flyweights **31** each of which is pivotally mounted on a separate peg **32** which is secured to and projects outwardly from the support plate **26**. The pegs **32** are diametrically opposed to each other and are located equidistantly from the axis of the shaft **15**. The lamination **31***a*, of each weight **31**, which is closest to the support plate **26** extends further away from the pivot point than the other laminations, thereby forming a support arm for a peg **33**. The peg **33** is secured to each support arm by inserting a reduced diameter shank portion through an aperture in the arm and peening over the end of the shank against the opposite side of the arm, as at **35**, Figure 4. Each of the pegs **33** project through an elongated slot **37** in a control arm **38** that is secured to or integrally formed on the sleeve **20** near the end of the sleeve that abuts the shoulder **28**. The control arm **38** is a generally rectangular, elongated member arranged symmetrically with respect to the sleeve **20**, and wherein the slots **37** of the arm are of equal length and spaced equidistantly from the axis of the shaft **15**.

It will now be evident that when the shaft **15** is rotated, the weights **31** pivot on the support plate **26** due to centrifugal force. The pegs **33**, through their contact with the side walls of the slots **37**, cause the control lever **38** to rotate and thus rotate the cam sleeve **20** relative to the shaft **15**.

A tension coil spring **39** is connected between each upstanding peg **33** and an anchoring post **40**, Figure 4, which is secured to the support plate **26** as by riveting. The springs **39** yieldingly resist centrifugal displacement of the weights and hence the rotation of the cam sleeve, and are effective to return the weights and the cam to initial position upon reduction in engine speed to idling or upon engine shut-down.

Ordinarily, the length of the slots **37** would determine the range of spark advance, since the radially outer end wall of the slots would arrest the movement of the pegs **33** and limit the pivoting movement of the weights **31**. It is a particular feature of the present invention that the range of spark advance can be adjusted to obtain optimum operating conditions of the particular engine on which the magneto **10** is mounted.

This adjustment is obtained by means of a screw **41** that is threaded into a tapped aperture (not shown) in an upstanding ear **42** at one end of the control arm **38**. As seen in Figure 3, the screw **41** overhangs the associated

slot **37** and limits the outward movement of the peg **33**. The screw **41** has a slotted outer end **43** and is locked in position by a locknut **44**.

In Figure 2, the position of the governor mechanism when the engine is stopped or idling, is illustrated. In Figure 3 the maximum pivoted position of the speed-responsive weights is shown. It will be readily recognized that the range of spark advance can be increased by backing the screw **41** out of the ear **42**, and that the range can be decreased by threading the screw further into the ear.

Referring to Figure 1, it will be seen that the casing **11** is provided with a tapped opening **45** into which a plug **46** is threaded. The opening **45** is directly opposite the slotted end **43** of the screw **41** when the mechanism is in the position indicated in Figure 2. The plug **46** can be easily removed so that a screwdriver may be inserted through the opening **45** and into the slotted end **43** to regulate the range of spark advance. The locknut **44** may be manipulated by means of a suitable wrench also inserted through the opening **45**.

From the foregoing description it will be seen that there is provided in this invention a novel, convenient device for varying the range of spark advance in a speed responsive ignition timer mechanism.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention.

I claim as my invention:

In an ignition timer including a timer shaft and a cam shaft rotatably sleeved thereon, centrifugal timer control means connecting said cam shaft in driven relation to said timer shaft, said means comprising a support member fixed on said timer shaft; a laminated flyweight pivotally mounted at one end on said support member; one lamination element thereof providing an extension beyond the opposite free end of the flyweight; a peg fixed to and outstanding on said extension; a flyweight loading spring between said peg and said support member; an arm member fixed to and extending radially of said cam shaft; said arm member having a radial elongated slot therein receiving said peg therethrough; a projection on the free end of said arm member; and a stop element carried by said projection and adjustably positionable longitudinally of said slot, provided for abutment by said peg to determine the limit of centrifugal displacement of the flyweight.

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