United States Patent [19]

Droke et al.

[11] **3,776,211**

[45] **Dec. 4, 1973**

[54] **ADJUSTABLE LIMIT FOR THE ADVANCE OF AN IGNITION DISTRIBUTOR**

[75] Inventors: **Darrell W. Droke**, Newport; **Donald R. Ochampaugh**, Bell; **Andrew G. Krumm**, Los Alamitos, all of Calif.

[73] Assignee: **Cragar Industries, Inc.**, Compton, Calif.

[22] Filed: **July 22, 1971**

[21] Appl. No.: **165,243**

[52] **U.S. Cl. 123/146.5 A**, 123/117 R, 123/146.5 R

[51] **Int. Cl.** **F02p 1/00**, F02p 5/04

[58] **Field of Search** ..... 123/117 R, 146.5 A, 123/146.5 R; 64/25

[56] **References Cited**

UNITED STATES PATENTS

3,430,459	3/1969	Hill	123/146.5
1,590,772	6/1926	Moore	64/25
2,699,657	1/1955	Vogel	1/1
3,196,224	7/1965	Tagliabue	200/22
2,677,946	5/1954	Purdy	123/117
2,391,525	12/1945	Spengler	123/117
2,107,470	2/1938	Crawford	123/146.5
1,896,714	2/1933	Mallory	123/117
3,482,559	12/1969	Salomon	123/117

Primary Examiner—Laurence M. Goodridge
Assistant Examiner—Ronald B. Cox
Attorney—Warren T. Jessup et al.

[57] **ABSTRACT**

An ignition distributor wherein a drive plate is fixed to the distributor input shaft; a pair of centrifugal weights are pivotally connected to the drive plate and normally biased to the retard position: an advance plate is pivoted with respect to the distributor shaft with the pivoting movement controlled by the centrifugal movement of the weights, the advance plate being connected to the distributor cam which is fixed to the output shaft: a stop plate movable with respect to the advance plate is locatable in various positions with respect thereto, each position establishing a different maximum outward movement of the centrifugal weights.

5 Claims, 4 Drawing Figures

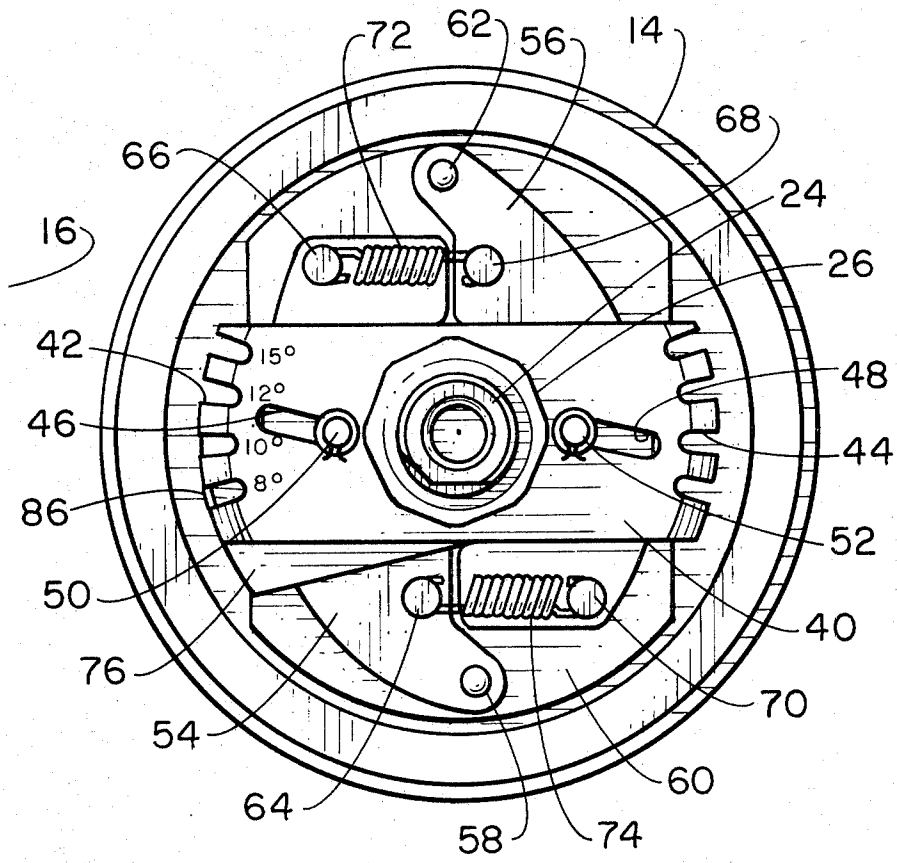


FIG. 1.

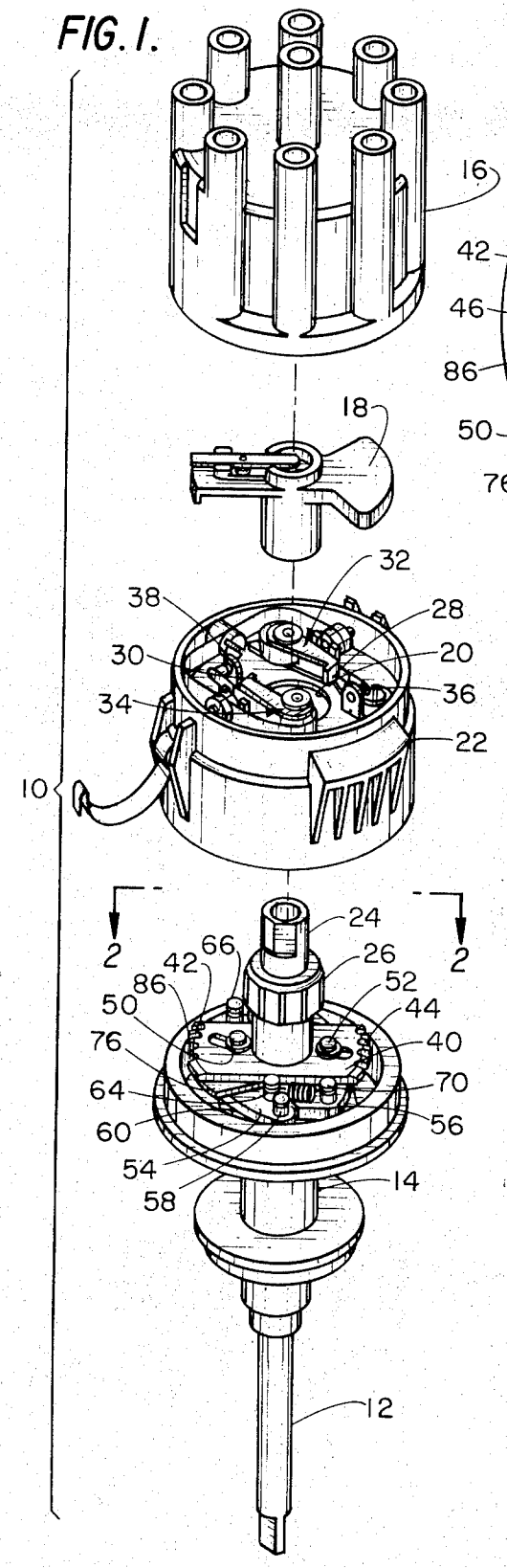


FIG. 2.

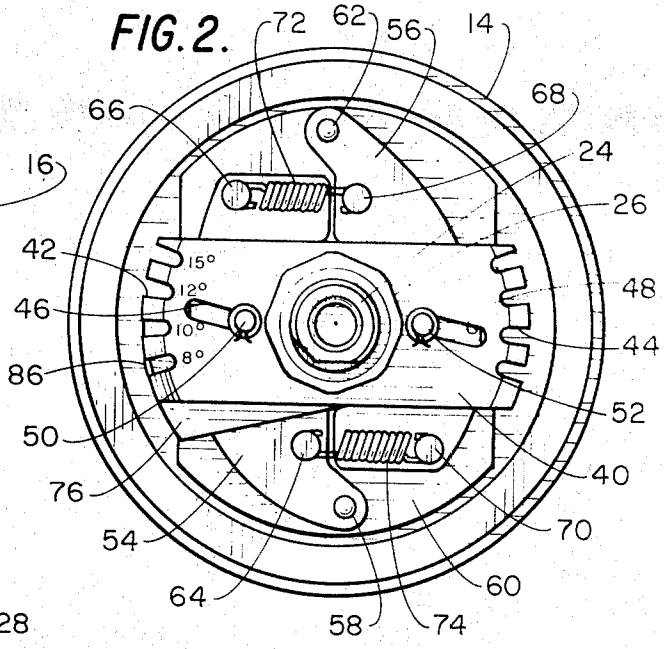
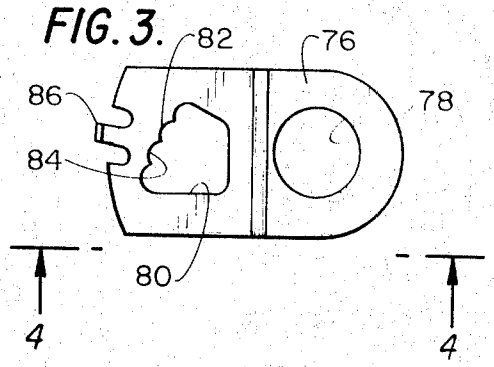


FIG. 3.



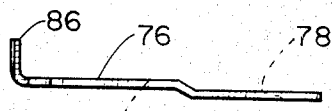


FIG. 4.

INVENTORS.
DARRELL W. DROKE
DONALD R. OCHAMPAUGH
ANDREW G. KRUMM
BY JESSUP & BEECHER
ATTORNEYS

ADJUSTABLE LIMIT FOR THE ADVANCE OF AN IGNITION DISTRIBUTOR

BACKGROUND OF THE INVENTION

The field of this invention relates to internal combustion engines and more particularly to a means in the ignition distributor which limits the advance of the firing of the engine.

A distributor can be defined as a rotary switch that directs the high voltage ignition current, in the proper firing sequence, to the various cylinders of the internal combustion engine. In automotive practice the distributor usually contains apparatus for timing the ignition so that firing occurs when the piston is at the optimum position in the cycle. This apparatus includes a set of cam-operated contacts called breaker points, the opening of which triggers the ignition pulse. The timing of the breaker point opening is made earlier at high engine speeds by means of the centrifugal action of small weights that are driven by the distributor shaft. Timing is also varied with engine load, by the movement of a diaphragm exposed to the pressure in the engine intake manifold.

The advance of the timing is very important to efficient and smooth operation of the engine. As the operating speed of the engine increases, it is desirable to further advance the igniting spark. However, the igniting spark can be advanced an excessive amount. If the advance of the spark is not checked, at unusually high vehicle operating speeds, the spark will be advanced so far as to cause the engine to operate inefficiently.

To prevent the problem of excessive spark advance, it is common to employ within the distributor of an engine a means to prevent the spark advancing beyond a predetermined amount. Centrifugal force responsive weights, which are caused to move radially outward as the velocity of the distributor shaft increases, is prevented from further outward movement upon reaching a predetermined amount of movement. In this way the advance of the spark is prevented permitted from exceeding a predetermined level.

The primary reason for the limiting of the advance of the spark is to make the engine run more efficiently. To have the engine operate more efficiently however, power is usually sacrificed. In certain types of vehicles it is not desirable to sacrifice power, as for example, racing cars, drag racers and the like, and it is desirable for such types of vehicles to not permit the spark to be advanced as high as it would be advanced in the normal passenger vehicle.

Additionally, different types of high performance vehicles need to have different levels of spark advance. For example, it may be desirable to advance the spark further in a drag racer than in a racer which is to be run over a long distance course. Also, it is not uncommon for the same engine to be used in different types of racing. Additionally, the same engine may be transformed into a passenger type vehicle for a period of time. As a result, it is desirable to be able to select various stopping points to limit the advance of the spark of the engine. By way of illustration, it may not be desirable in a long distance racer for the spark advance to exceed 10°. In the drag racer it may not be desirable for the spark advance to exceed twelve degrees. And, if the vehicle is being employed as a passenger vehicle, a more efficient operating limit such as fifteen degrees may be employed.

Heretofore, there have been known apparatuses to permit selective adjustment of the firing of the engine. However, such apparatuses have been quite complex in construction and as a result are quite costly to manufacture. Additionally, such previous apparatuses have necessitated the removal of a pin from one aperture and its relocation within another aperture to effect a change in the timing advance. Normally, such a removal and replacement of a pin is not readily accomplished within the tight quarters of a distributor housing. Additionally, if the pin is accidentally dropped, it may be impossible to find it without taking the entire distributor apart.

SUMMARY OF THE INVENTION

Basically, the apparatus of this invention is designed to be employed in conjunction with the conventional distributor apparatus. The conventional distributor apparatus includes an input (or distributor) shaft which is to be rotatably driven at varying speed by the engine crankshaft. A drive plate is fixedly connected to the input shaft within the distributor housing. A pair of weights are pivotally attached to the drive plate and located on either side of the distributor shaft. The weights are normally spring biased toward each other to the retard position of the timing advance. A pin is secured to each weight, with each pin cooperating in a respective slot formed in an advance plate. The slots formed in the advance plate are inclined, so that upon radially outward movement of the weights with respect to the distributor shaft, pivotal movement of the advance plate with respect to the distributor shaft will occur. The advance plate is fixedly secured to the output shaft (or the shaft upon which is located the distributor cam) which effects the opening and closing of the distributor breaking points. Specifically, the apparatus of this invention provides for the inclusion of a stop plate pivotally mounted on the distributor shaft and located between the weights and the advance plate. The stop plate includes at least one opening therein which cooperates with one of the pins extending from one of the weights. Along the width of the opening in the stop plate are located a plurality of different length slots which vary in radial distance with respect to the distributor shaft. The radially outermost end of each slot, upon being contacted by the pin connected to the weight, prevents the further radially outward movement of the weight assembly, thereby limiting the spark advance. Pawl or tab means is secured to the radially outermost edge of the stop plate and is adapted to cooperate with notch means formed in the advance plate. The pawl means and notch means fixedly retain, in a particular established angular position, the stop plate relative to the advance plate.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is an exploded perspective view of a conventional distributor within which is incorporated the apparatus of this invention;

FIG. 2 is a plan view of a portion of the distributor within which the apparatus of this invention is employed, taken along line 2—2 of FIG. 1;

FIG. 3 is a plan view of one form of the stop plate which is employed within this invention; and

FIG. 4 is a side view of the stop plate of FIG. 3 taken along line 4—4 of FIG. 3.

DETAILED DESCRIPTION OF THE SHOWN EMBODIMENT

Referring particularly to the drawing there is shown in FIG. 1 a distributor **10** which is designed to be employed in conjunction with an internal combustion engine (not shown). The crankshaft (not shown), which is the output shaft of the engine, effects rotation of the distributor shaft **12.** It is to be understood that as the engine crankshaft varies in rotational velocity, so also does the distributor shaft **12.** The distributor shaft **12** is rotatably supported by bearings (not shown) within the lower element **14** of the distributor housing. Within the distributor cap **16** are located a plurality of contact points (not shown), each of which is connected through a conductor (not shown) to a spark plug. Each spark plug effects ignition of the compressed fuel/air mixture located within a cylinder of the engine.

A rotor **18** is adapted to cooperate with the contacts located within the distributor cap **16.** The lower end of the rotor **18** passes through, and resides in, an opening **20** formed within the intermediate element **22** of the distributor housing. The distributor cap **16** comprises the upper element of the distributor housing. The lower end of the rotor **18** is fixedly positioned upon the output shaft **24.** A cam **26** is integrally formed upon the output shaft **24.** The cam **26** cooperates with followers **28** and **30** which are connected to their respective breaker point assemblies **32** and **34.** The breaker point assemblies **32** and **34** are conventional and need not be described here in detail. Basically, each of the breaker point assemblies **32** and **34** include a set of points **36** and **38,** respectively, which are openable and closable by means of the cam **26** via the followers **28** and **30.** It is to be noted that the two breaker point assemblies **32** and **34** are here shown. Normally, two such breaker point assemblies are employed only in high performance type of vehicles. It is to be understood that the apparatus of this invention equally readily employed upon a more conventional distributor which employs the use of only one breaker point assembly.

The output shaft **24** is fixedly secured to an advance plate **40.** Formed in one end of the advance plate **40** is a first set **42** of notches. Located on the opposite side of the advance plate **40** is a second set **44** of notches. The function of the notches **42** and **44** will be described further on in this specification. It is to be noted that both sets **42** and **44** comprise four of such notches. The number of the nothces is a matter of choice or design. It is further to be noted that, as shown in FIG. **2** of the drawing, the notches **42** are denoted by indicia of 8°, 10°, 12°, and 15°.

Also formed within the advance plate **40** are slots **46** and **48,** each inclined to the radius a predetermined amount. The reason for this inclination will become apparent further on in the description. Slot **46** is cooperable with a pin **50;** slot **48** is cooperable with a pin **52.** Pin **50** is fixedly secured upon a weight **54.** Pin **52** is fixedly secured to a weight **56.** One end of the weight **54** is pivotally connected through pivot pin **58** to a drive plate **60.** Similarly, one end of the weight **56** is pivotally connected through a pivot pin **62** to the drive plate **60.** The weights **54** and **56** are so located upon the drive plate **60** that the pivot pins **58** and **60** are substantially 180° apart with respect to the distributor shaft **12.** The drive plate **60** surrounds the distributor shaft **12** and is fixedly connected thereto. Secured to the upper surface of the weight **54** are pins **64** and **66.** Similarly, secured to the upper surface of the weight **56** are pins **68** and **70.** A spring **72** is connected between the pins **66** and **68.** Similarly, a spring **74** is connected between the pins **64** and **70.** The function of the springs **72** and **74** is to tend to maintain the weights **54** and **56** in the retard position (nearest each other).

The operation of the weights **54** and **56,** which is conventional, is as follows: The distributor shaft **12** effects rotation of the drive plate **60,** which in turn effects rotation of the weights **54** and **56.** As the centrifugal force increases, the weights **54** and **56** tend to move radially outward against the bias of springs **72** and **74.** The amount of radially outward movement of the weights **54** and **56** is dependent upon the rotational velocity of the shaft **12.** In other words, as the rotational velocity of the shaft **12** increases, the further outward is the amount of radial movement of the weights **54** and **56.** As the weights **54** and **56** move outwardly, the pins **50** and **52,** through their respective slots **46** and **48,** effect pivotal movement of the advance plate **40** with respect to the distributor shaft **12.** Since the output shaft **24** and the cam **26** are fixedly secured to the advance plate **40,** pivotal movement of the output shaft **24** and the cam **26** also occurs with respect to the distributor shaft **12.** As a result, the points **36** and **38** of the breaker point assemblies **32** and **34** are caused to open up a few degrees earlier (or in advance) due to the pivoting of the output shaft **24** with respect to the input shaft **12.**

Located intermediate the advance plate **40** and the weight **54** is a stop plate **76.** The stop plate **76** has a circular opening **78** formed therein residing around the input shaft **12.** Also located in the stop plate **76** is an opening **80.** Basically, the opening **80** is composed of a plurality of different length slots connected together side by side. It is to be noted that the end **82** of the slot comprises a series of recesses **84** formed on an angle. Integrally secured to the radially outermost edge of the stop plate **76** tab or pawl **86.**

With the stop plate **76** located so that opening **78** is circumjacent the input shaft **12** and with the stop plate **76** located between the advance plate **40** and the weight **54,** the pin **50** passes through opening **80.** With the tab or pawl **86** cooperating with the 8° notch **42** of the advance plate **40,** the pin **50** is capable of coming into contact with that recess **84** which is the radially shortest distance from the distributor shaft **12.** When such occurs further radial outward movement of the weights **54** and **56** is prevented. When this occurs, the rotation of the output shaft **24** with respect to the input shaft **12** has been approximately 8°.

It is to be understood that the mechanic or operator may cause the pawl **86** to cooperate with any of the notches **42** such as the 10° notch, 12° notch, or the 15° notch. Such movement of the pawl **86** can be easily accomplished by manually pressing on the top of pawl **86,** causing the stop plate **76** to deflect downward a slight amount permitting the pawl **86** to be moved out of cooperation with one notch **42** and into cooperation with another notch **42.** It is to be understood that with the pawl **86** located in the 10° notch, the pin **50** would be adapted to come into contact with the next-to-the-shortest-in-length recess **84.** In the 15° position, the pin **50** will be caused to come into contact with that recess **84** which is located the radially greatest distance from the distributor shaft **12.**

It is to be noted that located on the opposite side of the advance plate **40** are a second set of notches **44.** The second set of notches **44** may be employed if the stop plate **76** is modified so as to include an additional length having another opening similar to opening **80** and another tab or pawl similar to tab or pawl **86.** The second pawl would be adapted to cooperate with the notches **44.** The second opening similar to opening **80** would cooperate with the pin **52.** This modification is redundant. However, for safety reasons it may be employed to insure that there will be a positive stopping of the outward movement of the weights **54** and **56** at the proper advance position. Both the weights **54** and **56** should inherently move in synchronism, but this modification would insure that the weights stop in synchronism. It is not necessary that a second pawl be employed to cooperate with the notches **44** as only the single pawl **86** would be satisfactory.

What is claimed is:

1. In combination with an ignition distributor having an input shaft and an output shaft, a drive plate fixed to said input shaft, an advance plate fixed to said output shaft, a weight assembly connected to both said drive plate and said advance plate, said weight assembly being movable upon being subjected to centrifugal force, movement of said weight assembly effecting pivotal movement of said output shaft relative to said input shaft, the improvement comprising:

a stop plate pivoted about said input shaft intermediate said advance plate and said drive plate, and adjustable to a plurality of different positions, each of said positions limiting a different amount of maximum movement of said weight assembly.

2. Apparatus as defined in claim **1** wherein:

said weight assembly includes a pin assembly fixed thereto for effecting movement of said advance plate, said pin assembly cooperating with an opening arrangement in said stop plate.

3. Apparatus as defined in claim **2** including:

notch means formed in said advance plate, and

tab means secured to said stop plate adapted to cooperate with said notch means.

4. Apparatus as defined in claim **3** wherein:

said weight assembly includes two weights,

said pin assembly includes a pin secured to each of said weights, and

said opening arrangement includes a pair of spaced apart openings,

each of said pins cooperating with one of said openings.

5. Apparatus as defined in claim **4** wherein:

said tab means includes a pair of spaced apart tabs, and

said notch means includes dual, spaced apart sections of a plurality of notches each.

* * * * *