Dec. 9, 1969 R. SALOMON 3,482,559

IGNITION DISTRIBUTOR FOR INTERNAL COMBUSTION ENGINES

Filed Feb. 5, 1968

FIG. 1

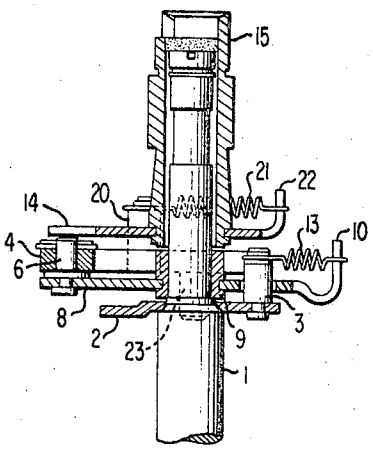
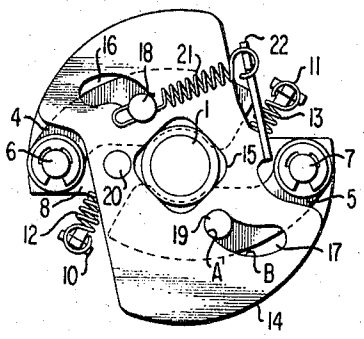


FIG. 2



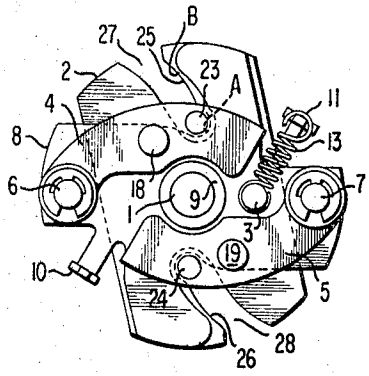


FIG. 3

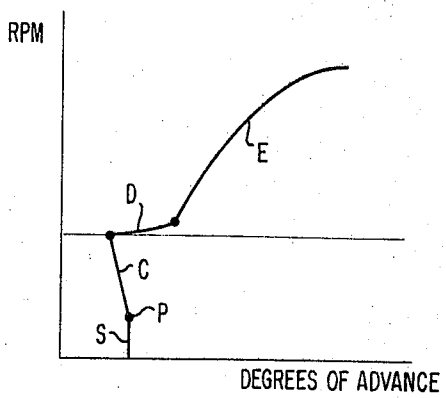


FIG. 4

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IGNITION DISTRIBUTOR FOR INTERNAL COMBUSTION ENGINES

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Int. Cl. F02p 1/00, 5/04
U.S. Cl. 123—146.5 4 Claims

ABSTRACT OF THE DISCLOSURE

The centrifugal advance mechanism of an ignition distributor is provided with a floating centrifugal weight plate which is constrained in its movement relative to the distributor shaft and which imparts movement to the plate controlling the point of ignition. The constraint is such as to maintain a fixed advanced characteristic for the control plate at cranking speed, to then retard the ignition point at idling speed, and to then advance the ignition point at operating speeds above idling and low speed operation.

BACKGROUND OF THE INVENTION

As a consequence of the contemporary concern over air pollution, the problem of emission control relative to internal combustion engines has received a great deal of attention and various solutions have been proposed. One solution is to significantly retard the ignition point at idle and low engine speeds and various mechanisms have been proposed to achieve this. For the most part, however, such mechanisms are characterized by relative complexity and are propense to the requirement for constant or frequent servicing in order to maintain them in proper operating condition.

The reason for this is that the amount of ignition delay necessary to significantly and favorably affect exhaust emission corresponds to an ignition delay which would render the engine difficult to start. Therefore the distributor mechanism and more particularly its advance curve characteristics must be tailored to estabilsh a relatively advanced ignition point at engine cranking speed to allow the engine easily to start and then during idle and low speed operation subsequent to starting, the ignition point must be retarded and then it must advance ultimately in the usual fashion as the engine speed is increased to obtain the requisite power characteristics conventionally well known in the art.

BRIEF SUMMARY OF THE INVENTION

The present invention relates first of all to an ignition distributor mechanism wherein the requisite ignition advance-retard-advance characteristics specified above are achieved directly as a result and incidental to the operation of a conventional centrifugal advance mechanism. This is accomplished by utilizing a floating plate which mounts the centrifugal weights with the weights being provided with pin means operating both against the distributor shaft or more especially a plate rigid therewith, and against the control plate which controls the opening of the ignition contact points. The pins carried by the weights are initially bottomed in precontoured slots so as to establish a rigidly fixed ignition advance characteristic for engine cranking speeds. As soon as the engine starts, the centrifugal weights swing outwardly initially to retard the ignition point and thereafter to advance the ignition point as the engine speed is increased.

BRIEF DESCRIPTION OF THE FIGURES OF THE DRAWING

FIG. 1 is a longitudinal section of a centrifugal advance mechanism in accordance with the invention;

FIG. 2 is a plan view of the mechanism shown in FIG. 1;

FIG. 3 is a plan view of the mechanism shown in FIG. 1, with the cam plate removed; and

FIG. 4 represents the ignition advance curve obtained from a distributor conforming to the invention.

DETAILED DESCRIPTION OF THE INVENTION

With reference now more particularly to FIGS. 1 and 3, the conventional distributor shaft is indicated by the reference character **1** and will be understood to be driven directly from the associated internal combustion engine not shown, in the usual fashion. This shaft is provided with a plate **2** which is rigidly affixed and rotates in unison with the shaft and which carries an upstanding pin **3** forming an anchoring post for one end of the tension spring **13**. The opposite end of the tension spring **13** is attached to a tang **10** on the centrifugal weight plate **8**. The plate **8** is free floating on the shaft **1** and for this purpose a bushing **9** is provided on the shaft as will be clearly evident from FIG. 1. The pin **3** projects upwardly through the plate **8** and passes through an enlarged opening therein so as not to interfere with relative motion of the plate **8** with respect to the shaft **1**. As will be evident from FIG. 3 in particular, assuming the plate **2** to be fixed, the tension spring **13** serves to impart a counterclockwise rotation to the plate **8** relative to the plate **2**. The plate **8** carries a pair of upstanding pins **6** and **7** which rotatably mount the centrifugal weights **4** and **5** which are of entirely conventional construction and operation. However, the two weights **4** and **5** carry depending pin members **23** and **24** which are received in the specially formed slots **27** and **28** of the distributor shaft plate **2**, see particularly FIG. 3.

Normally, the tension spring **13** serves to bottom the pins **23** and **24** within their respective slots **27** and **28** and as will hereinafter appear, this corresponds to a predetermined degree of ignition advance for easy starting of the internal combustion engine.

The weights **4** and **5** also carry upstanding pins **18** and **19** which project through slots **16** and **17** in the control plate **14** as can be seen best in FIG. 2. One of these pins **18** serves to anchor one end of a tension spring **21** which is anchored at its opposite end to the tang **22** formed on the control plate **14**. The control plate **14** is fixed to the cam **15** which, as is conventional, is rotatable with respect to the shaft **1** and serves to relatively advance or retard the cam in a manner well known and understood in the art. It will also be understood that the cam **15** is adapted to mount the usual ignition rotor at its upper end.

The plate **14** also carries a depending pin **20** to which one end of a tension spring **12** is anchored and the opposite end of which is anchored on the tang **10** on the plate **8**. Thus, the spring **13** as mentioned tends to bottom the weight pins **23** and **24** in their respective slots **27** and **28** whereas the spring **12** serves to rotate the plate **14** counterclockwise with respect to the plate **8** and bottom the pins **18** and **19** in their respective slots **16** and **17**. The spring **21** acts both to impart counterclockwise rotation of the plate **14** with respect to the plate **8** and to return the weight **4** to its inwardly swung position, automatically also returning the weight **5**. The configurations of the slots **16** and **17** and of the slots **27** and **28** are such as to achieve an ignition advance curve according to FIG. 4 wherein the ordinate is representative of engine speed and the abscissa of which is indicative of the degree of ignition advance. Engine speed is increasing from

left to right along the ordinate and ignition timing is advancing from bottom to top along the abscissa. The portion of the advance curve indicated by the reference character S and which displays a fixed ignition advance point corresponds to engine cranking speed wherein the pins **23** and **24** are bottomed in the slots **27** and **28** and the pins **18** and **19** are likewise bottomed in the slots **16** and **17** and the level of ignition advance corresponds to the proper level for ease of engine starting. As soon as the engine has started and the speed has increased to and beyond the point P the initial tension of the springs will be overcome and the weights **4** and **5** will begin to swing outwardly. Due to the contour of the slots **27** and **28** during this initial movement of the weights, the plate **8** will move counterclockwise with respect to the plate **2**, in the direction of ignition retardation, and at the same time, the contour of the inner portions of the slots **16** and **17** will impart a counterclockwise rotation of the plate **14** relative to the plate **8**, in the direction of ignition retardation and the total retardation is the net retardation of the plate **14** as is represented by the line C in FIG. 4 until a maximum retardation is reached which, through proper contouring of the several slots may be made to manifest itself over some small range of increasing engine speed as shown in FIG. 4. Thereafter, increasing engine speed will continue the added swinging of the weights **4** and **5** and the contours of the slots **27** and **28** as for example in the region **26** of the slot **28** will now cause the plate **8** to rotate clockwise with respect to the plate **2** and will cause the plate **14** to rotate clockwise with respect to the plate **8**, both movements in the direction of ignition advance so that the advance characteristic D and ultimately the characteristic E of FIG. 4 will be achieved upon increasing engine speed.

The above advance characteristics are due to the two different cam surfaces A and B in the shaft plate **2** as shown for the slot **27** in FIG. 3 (B of slot **27** corresponding to **26** of slot **28**) and to the portions A' and B' of the slots **16** and **17** in the plate **14** as shown in FIG. 2. The different portions of the slots in each case having different directions to establish first counterclockwise relative rotations of the plates **8** and **14** followed by clockwise rotations of these plates.

Obviously, many modifications and variations of the present invention are possible in the light of the above teachings.

What is claimed is:

1. An ignition distributor for internal combustion engines comprising, in combination,

a distributor shaft adapted to be driven by an internal combustion engine,

a control plate journalled on said shaft,

and centrifugal weight means for controlling said control plate rotationally with respect to said shaft, said centrifugal weight means comprising a centrifugal weight plate journalled on said shaft and a centrifugal weight pivotally mounted thereon, first cam means coupling said centrifugal plate to said shaft for rotating said centrifugal weight plate in one direction with respect to said shaft at successively first and second rates in response to pivotal motion of said weight, second cam means coupling said centrifugal weight to said control plate for rotating said control plate in the opposite direction at a third rate with respect to said shaft, said first and second rates being respectively greater and lesser than said third rate whereby outward pivoting of said centrifugal weight first causes lagging of said control plate with respect to said shaft and then leading of said control plate with respect to said shaft.

2. In the ignition distributor as defined in claim **1** wherein said third rate progressively increases as said centrifugal weight is pivoted outwardly.

3. An ignition distributor according to claim **1** wherein said means also includes a pin carried by said centrifugal weight, said control plate having a cam slot receiving said pin and having two different cam surfaces defined thereby.

4. The ignition distributor as defined in claim **1** wherein said means includes a fixed plate carried by said shaft for rotation therewith and disposed in spaced parallelism with said control plate, said centrifugal weight plate being disposed, between said fixed and control plates and in parallelism therewith, said fixed plate having first and second cam surfaces establishing said first and second rates and said control plate having a cam surface establishing said third rate, spring means normally urging said centrifugal weight inwardly with respect to said shaft, and a pair of pins carried by said centrifugal weight for engaging the cam surfaces of said fixed and control plates.

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U.S. Cl. X.R.

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