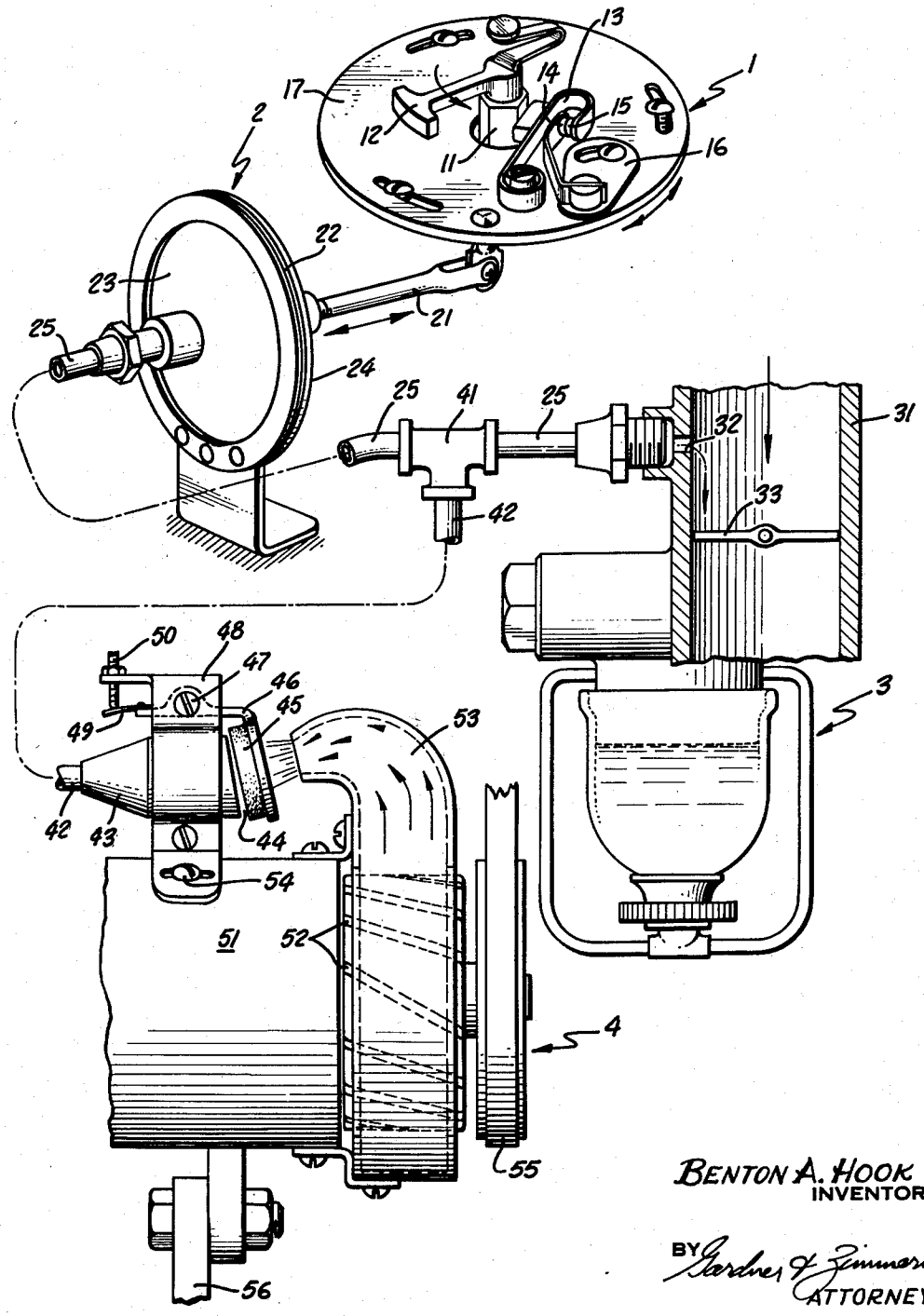
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ENGINE IGNITION CONTROL

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ENGINE IGNITION CONTROL

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The present invention relates to engine ignition control, and in more particular to a fuel ignition system for an internal combustion engine in which an igniting spark is variable in point of time with respect to the other phases of engine operation, and in which such variation is controlled by pressure changes in the air supply to the engine.

There have been such systems in which the spark advance and retard is actuated by a pressure responsive diaphragm subject to the pressure variations of the carburetor intake ahead of the butterfly valve. However, such systems have tended to advance the spark more rapidly than the engine speed has warranted.

Therefore, it is an object of the present invention to modify the action of a pressure controlled spark timing system so that the timing will be a function of both carburetor air intake pressure and engine speed, and it is a further object to interpret such engine speed by means of the air output of a fan driven by such engine.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of the preferred form of the invention which is illustrated in the drawing accompanying and forming part of the specification. It is to be understood, however, that variations in the showing made by the said drawing and description may be adopted within the scope of the invention as set forth in the claims.

The above mentioned defects are remedied and these objects attained by modifying a conventional spark advance and retard system of an internal combustion engine using a pressure diaphragm actuated by the carburetor intake pressure as the spark advance-retard control by venting the line, or duct, between the carburetor and the diaphragm, spring biasing a closure for said vent to an open position, and overcoming the bias of such spring by a stream of air from either the radiator or generator fan to close such vent when the speed of the motor has reached a desired value.

An ignition control system constructed in accordance with the above outline is hereinafter described in detail and shown in the accompanying drawing, in which there is schematically shown, with parts broken away and in perspective, those elements of an internal combustion engine's accessory parts necessary for an understanding of the present invention.

In the drawing there is shown in perspective parts of an ignition distributor 1 and a diaphragm housing 2 which has therein a diaphragm which upon actuation advances or retards the ignition, and in elevation portions of a carburetor 3 and the fan end of a generator 4.

The parts of the distributor which have been shown are the breaker cam 11 and the distributor arm 12 which rotate together with the upper end of a distributor shaft (not shown) at half the engine speed in a four cycle engine; the breaker arm 13 which is moved by the breaker cam 11 to open and close the contacts 14, 15, one of which is secured to the arm and the other to a bracket 16; and the breaker plate 17 which carries the arm and contacts,

and is coaxial of the cam and rotatably supported thereabout.

Rotation of the breaker plate 17 advances or retards the spark and, thereby, the inception of the fuel ignition phase is varied in point of time with respect to the other phases of the engine operation. This rotation of the breaker plate is obtained by means of a link 21 connected at one of its ends to the breaker plate and at its other end to one side of a diaphragm 22 held between the two halves 23, 24 of the diaphragm housing 2. The side of the diaphragm to which the link is connected is open to the atmosphere through the half housing 24 and the other side is sealed from the atmosphere by the half housing 23 but communicates with a duct 25. The link is guided in the unsealed half housing. The housing 2 is supported on a fixed bracket 26.

The duct 25 establishes communication between the sealed side of the diaphragm and the intake 31 of the carburetor 3 through a small opening 32 located adjacent the butterfly valve 33 and on the air inlet side of the valve. Thus any changes in pressure in the carburetor inlet are communicated to the diaphragm and in the manner of such devices the diaphragm is moved by such changes in pressure to move the link 21.

Placed in the duct 25 is a T 41 having one branch thereof communicating with a vent line 42 which in turn communicates with a vent end 43 formed with a vent 44, or vent opening. Adjacent the vent opening 44 is a closure 45 that is pivotally supported in registry with the vent for closure thereof. The closure has fixed thereto an arm 46 that is rotatably supported on a pivot 47 secured in bracket 48, and fixed to the arm is a spring leaf 49 that is biased by a screw 50 threaded in the bracket in a manner that holds the closure away from the vent when the engine is not operating. The vent end and bracket 48 are secured to the housing 51 of the generator 4, which is found on most internal combustion engines, near its fan 52 which is usual with such generators for the purpose of moving air through the generator for cooling it during its operation by the engine. A housing 53 is provided for the fan so as to collect air from the fan and direct it upon the vent closure 45. The force of this air impinging upon the closure tends to overcome the bias applied to the spring 49 which holds the closure away from the vent. The area of the closure presented to the air stream is fixed at a value and the applied bias is such that when the air velocity, and, hence, the engine speed, has reached a desired value the closure will be forced upon the vent to close it. The force of the air stream on the closure may be varied at a given fan speed by varying the distance between the closure and the fan housing outlet, as is provided for by the screw and slot 54 holding the bracket to the housing. A belt 55 may be used to drive the generator from the engine, and the generator may be mounted on an arm 56 fixed to the engine.

Most internal combustion engines employ a fan for moving air through a radiator for cooling water. This radiator fan may be used instead of the generator fan to deliver air to the vent closure to overcome the bias thereon. Further, static pressure, as from oil under pressure from the engine's oil pump, or a direct connection to the engine, could be used to close the vent in a manner easily devised by a mechanic given the present disclosure.

The operation of the present fuel ignition system is such that when the engine is idling with the butterfly valve 33 closed, the pressure in the carburetor intake 31 and on both sides of the diaphragm 22 is atmospheric, and under this condition the spark is retarded. Further, at idling speeds of the engine, the delivery of air to the vent closure 45 by the generator fan 52 is not of a velocity which will overcome the bias on the spring 49. When the butterfly valve 33 is opened, the pressure in the carburetor intake

31 is lowered and tends to drop in the communicating duct 25 but is prevented from doing so by the intake of air through the vent 44 which is open due to the bias of the spring 49 on the closure 45 and the fact that the speed of the air from the fan 52 is not high enough at lower engine speeds to overcome this bias. This prevents the spark from being advanced at the moment when the butterfly valve is opened. However, when the speed of the engine reaches a predetermined value, the force of the air coming from the generator will overcome the bias on the vent closure and force the closure on the vent and prevent the flow of air therethrough. This allows the pressure to drop in the duct 25 and on the diaphragm 22, which drop in pressure actuates the diaphragm to move the link 22, to rotate the breaker plate 17, and to thus advance the spark. Thus the point at which ignition occurs in the engine's compression cycle is a function of the rate of air flow through the carburetor and of engine speed, as, in this showing, interpreted by a fan driven by the engine. By the use of the word "fan" applicant means "fan," "blower," or "pump."

Having thus described my invention, a form of its construction, and its operation, I claim:

1. In an internal combustion engine having an air fan effecting an air quality variable in relation to engine speed, a fuel ignition inception phase which is variable in point of time with respect to the other phases of engine operation and a fuel ignition device suitable therefor which includes a duct subject to variable pressures functionally related to engine speed, the combination therewith of a vent for said duct, a normally open closure for said vent, and means for positioning said closure in accordance with variations in such air quality from said fan to thereby modify such functional relationship.

2. In an internal combustion engine having an air fan effecting an air quality variable in relation to engine speed, a fuel ignition system having means for inducing an igniting spark which is variable in point of time with respect to the other phases of engine operation and said system including a duct subject to variable pressures functionally related to engine speed, and a pressure change responsive device for varying such point of time in response to variations in pressure in said duct, the combination therewith of a vent for said duct, a closure for said vent, and means for positioning said closure in accordance with variations in such air quality from said fan to thereby modify such functional relationship.

3. In an internal combustion engine having an air fan effecting an air quality variable in relation to engine speed, a fuel ignition system having means for inducing an igniting spark which is variable in point of time with respect to the other phases of engine operation and said system including a duct subject to variable pressures functionally related to engine speed, and a pressure change responsive device for varying such point of time in response to variations in pressure in said duct, the combination therewith of a vent for said duct, a closure for said vent, a spring biasing said closure to open position, and said fan and closure being so related that variations in such air quality will affect the bias of said spring on said closure.

4. In an internal combustion engine having an air fan for moving air therethrough at a rate variable in relation to engine speed, a spark advance and retard means including a pressure responsive diaphragm for actuating said means to effect such advance or retardation, and a duct communicating with said diaphragm, said duct subject to variable pressures functionally related to engine speed whereby a variation in such pressure will actuate said diaphragm, the combination therewith of a vent for said duct, a closure for said vent, a spring biasing said closure to open position, and said fan and closure being so related that variations in the rate of air moving through said fan will affect the bias of said spring on said closure.

5. In an internal combustion engine having an air fan for moving air therethrough at a rate variable in relation to engine speed, a spark advance and retard means including a pressure responsive diaphragm for actuating said means to effect such advance or retardation, and a duct communicating with said diaphragm, said duct subject to variable pressures functionally related to engine speed whereby a variation in such pressure will actuate said diaphragm, the combination therewith of a vent for said duct, a normally open closure for said vent, and means controllable by the speed of said engine independently of said first mentioned variable pressures for closing said closure.

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