

Dec. 26, 1939.

J. L. ARTHUR ET AL

2,184,789

IGNITION APPARATUS

Filed March 13, 1939

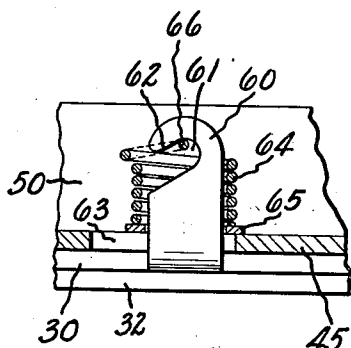


Fig. 3

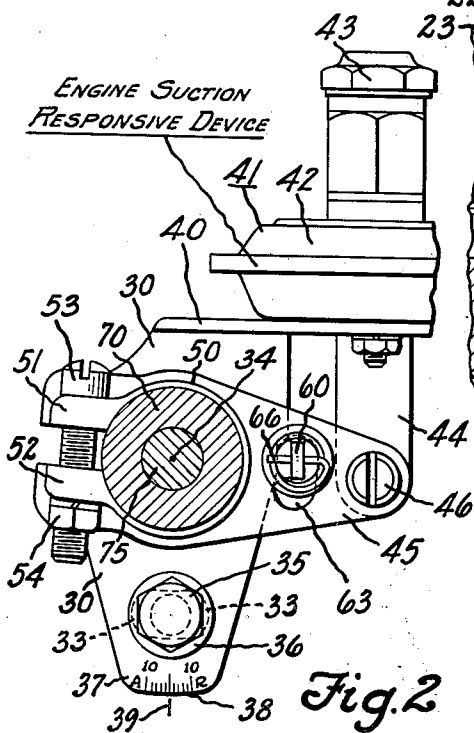


Fig. 2

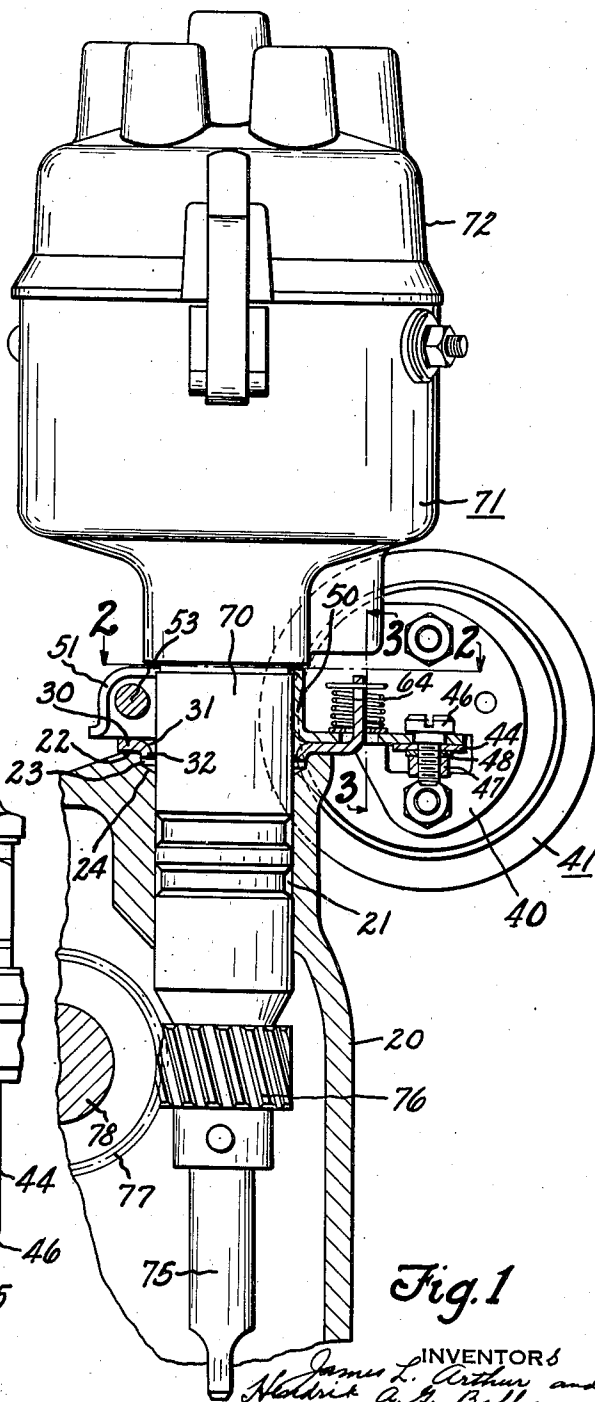


Fig. 1

INVENTORS
James L. Arthur and
Nobert A. Boller
BY
Spencer Hardman & Fehr
ATTORNEYS

UNITED STATES PATENT OFFICE

2,184,789

IGNITION APPARATUS

James L. Arthur, Anderson, Ind., and Hendrik A. G. Boller, Walled Lake, Mich.; said Arthur assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Application March 13, 1939, Serial No. 261,508

3 Claims. (Cl. 123—117)

This invention relates to the type of ignition apparatus for internal combustion engines which provides for controlling the timing of the ignition in response to variations in engine intake suction.

One form of such apparatus is shown in Patent No. 2,107,470 granted to James M. Crawford and Henry A. Schwager, February 8, 1938. That patent discloses an ignition timer having a cup-like housing provided with a shank which fits within a wall provided by the engine crank case and which supports the timer drive shaft carrying, at its exposed end, a gear which meshes with an engine driven gear when the timer is mounted upon the engine crank case. Adjacent the upper end of the wall, the crank case provides a plane surface at right angles to the axis of the wall. Upon this plane surface there rests a hold-down plate in turn supporting an adjustable clamp arm tightened by a screw around the shank of the timer housing. The hold-down plate carries a device having a part movable in response to engine intake suction and connected to the clamp arm so that the timer housing can be rotated within the wall by said device. The hold-down plate can be secured to the engine crank case in various positions of adjustment so that the initial position of the engine-suction-responsive device relative to the engine may be varied.

An object of the present invention is to improve upon this type of ignition apparatus by making provisions for the facile removal from the engine crank case of the ignition timer housing with the clamp arm attached thereto, while the hold-down plate supporting the engine-suction-responsive device remains attached to the crank case. To accomplish this object we provide means independent of the clamping arm for attaching the hold-down plate to the engine crank case in various positions of adjustment; and we provide readily accessible means for attaching the clamp arm to the movable member of the engine-suction responsive device; and also we provide a quick-detachable means for resiliently holding the clamp arm in engagement with the hold down plate. This quick detachable means comprises a hook integral with the hold down plate and extending through a dot in the clamp arm, said hook receiving a cross-pin formed by the upper end of a helical coil spring which surrounds the hook and bears at its lower end against the clamp arm to urge the same and the timer housing against the hold-down plate. By compressing this spring beyond its initial state of compression, the cross pin provided by this spring may be disengaged from the hook so that this

spring may be removed; and after disconnecting the clamp arm from the engine-suction-responsive device the timer housing with clamp arm attached thereto may be removed for repairs and adjustment without disturbing the relation of the hold down plate to the engine crank case. After repairs or adjustments have been made to the ignition timer housing it may readily be replaced upon the engine crank case in the proper relation to the engine driven gear member.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing wherein a preferred embodiment of the present invention is clearly shown.

In the drawing:

Fig. 1 shows a fragmentary sectional view of an engine crank case with which an ignition timer distributor unit shown in side elevation is associated. Fig. 1 also shows in section the hold-down plate and the clamping lever arm which carries the device responsive to engine suction for varying the timing of the ignition.

Fig. 2 is a plan view partly in section, this section being taken approximately on the line 2—2 of Fig. 1.

Fig. 3 is a fragmentary sectional view taken on the line 3—3 of Fig. 1 and is drawn twice the scale of Figs. 1 and 2.

Referring to the drawing, numeral 20 designates a fragment of the engine crank case. Crank case 20 is provided with a tubular bore or well 21, the upper end of which terminates with a plane surface 22, which is counterbored at 23 and then taper bored at 24.

Plane surface 22 provided by crank case 20 receives and supports a hold-down plate 30 having a central opening 31 for receiving the shank of an ignition timer to be described. The opening 31 is defined by an annular flange 32 received by the counter-bore 23 provided by the crank case 20. Hold-down plate 30 is provided with an arcuate hole 33, the center of curvature of which is the point 34 (Fig. 2) denoting the axis of the well 21. Hold-down plate 30 may be secured upon the plane surface 22 of the crank case 20 by a screw 35 having a hexagonal head and having a shank passing through a washer 36 and threadedly engaging a tapped hole in the crank case 20. The edge portion 37 of the hold-down plate 30 is provided with graduations and indicia indicated at 38 which cooperate with a mark or other designation 39 stamped on the plane surface 22 of the crank case 20. The proper setting of the hold down plate 30 having been deter-

mined, the plate is moved so that the predetermined graduation 38 is opposite the mark 39 and then the screw 35 is turned down so as to clamp the hold down plate 30 against the engine crank case 20 in the desired position.

Plate 30 is shaped so as to provide a vertically disposed bracket 40 to which an engine-suction responsive device 41 is attached. The device 41 comprises a diaphragm housed within a diaphragm case 42 and forming a flexible side wall for a suction chamber. Communication between this suction chamber and the engine intake fuel passage is provided by a pipe, not shown, which is connected to the device 41 by a pipe coupling member 43. The flexible diaphragm is connected by a link 44 with a clamping lever arm 45 by means of a screw 46. A nut 47 receives the screw 46 to attach the same to the link 44. A lock washer 48 is located between the nut 47 and the lower side of the link 44 to prevent accidental loosening of nut 47.

The clamp arm 45 is shaped so as to provide a cylindrical portion 50 which is adapted to conform to the shank 70 of an ignition timer housing 71 which together with a distributor cap 72 houses the timer-distributor mechanism of the ignition unit. The cylindrical part 50 of the clamp arm 45 terminates in clamping lugs 51 and 52 through which pass a clamping bolt 53 which cooperates with a clamping nut 54 to tighten the cylindrical part 50 around the shank 70 of the timer housing 71. Thus the lever 45 may be clamped to the shank 70 of the timer housing 71 in the desired position of adjustment.

If the ignition unit 71 were being used on a stationary engine, which is not subject to vibration due to road shocks, as is the case of an engine of an automotive vehicle, it could be depended upon that the clamp arm 45 would always remain in contact with the hold-down plate 30 due to the weight of the distributor unit 71 supported thereby. In case of a distributor unit for an internal combustion engine used in automotive vehicles, it is desirable to provide some means for insuring that the clamping lever arm 45 will be maintained against the hold-down plate 30. It is desirable that the provisions for maintaining the clamping arm 45 in contact with the hold-down plate 30 be yieldable in character. One object of the present invention is to provide a yielding connection between the hold-down plate and the clamp arm lever 45 which is simpler in construction and therefore capable of being manufactured at lower cost than any device of similar character which has been used heretofore.

In accordance with the present invention we provide the hold-down plate with an upwardly extending lug 60 provided with a notch 61 defining a hook 62. The lug 60 extends upwardly through an arcuate slot 63 formed in the clamp arm 45. The slot 63 is arcuate, the center of curvature being at the center of the cylindrical portion 50 of the arm 45. That center is represented by the dot 34 in Fig. 2. The arcuate slot 63 may be of such length as to serve as means for limiting the angular movement of the clamp arm 45 relative to the hold-down plate 30. By allowing the lug 60 to strike either end of the slot 63, means are provided for limiting the amount of angular movement which can be imparted to the clamping lever arm 45, by the diaphragm within the suction chamber 42 of the suction responsive device 41. The lug 60 is surrounded by a coiled spring 64 bearing upon a

washer 65 which in turn bears upon the clamp arm 45. The upper end of the spring 64 provides a cross-pin 66 which is received within the notch 61 defining the hook 62 of lug 60. The spring 64 serves to maintain the clamp arm 45 in engagement with the hold-down plate 30 with yielding pressure. The cross-pin 66 merges with an end turn of the spring 64 which is deformed slightly outside the external periphery of other turns of the spring 64 so that this end turn cannot become inter-locked with any other turns of this spring, when the apparatus is subjected to vibration in shipment or service. This construction therefore prevents such distortion of the spring 64 as might cause it to become accidentally disengaged from the hook 62.

The timer distributor unit 71 is operated by a drive shaft 75 which has a bearing in the shank 70. Drive shaft 75 carries a spiral gear 76 meshing with a spiral gear 77 fixed to the engine cam shaft 78. It is desirable that no displacement vertically takes place between the shaft 75 and the shaft 78 because such vertical displacement would disturb the driving relation between the spiral gears 76 and 77 and would interfere with the timing of the ignition.

The spring 64 provides a quick detachable connection between the hold-down plate 30 and the clamp arm 45. This is of great advantage when removing the ignition timer distributor unit 70 from the engine crank case 20 in order to make repairs and adjustments thereto. The repair man removes the screw 46 which connects the clamp arm 45 to the link 44 of the engine-suction responsive device carried by the hold-down plate 30. Then, by compressing the spring 64 still further so as to lower the cross-pin 66 thereof below the hook 62, this cross-pin can be moved so as to clear the hook 62; and then the spring 64 can be removed thereby releasing the clamp arm 45 from its connection with the hold-down plate 30. Then the timer distributor unit 71 may be removed from the engine crank case 20 carrying with it the clamp arm 45 which has previously been clamped around the shank 70 of the unit 71 in the desired position of adjustment since the clamp arm 45 remains assembled with the distributor unit 71 when it is removed from the engine crank case 20 for repairs, the repair man has no difficulty in reassembling the distributor unit 71 with the engine, because the presence of the clamp arm not only shows him how to reconnect the distributor unit 71 properly with the suction responsive device 41, but it shows him also how to connect the distributor unit properly with the crank case 20 and the gear 76 of the distributor unit properly with the gear 77 driven by the engine cam shaft. Obviously the relation of gear 76 to the shank 70 should be marked at the time of removal of the unit 71 from the engine frame.

The construction which we have provided is advantageous also for the reason that the distributor unit 71 together with its clamp arm 45 may be removed without disturbing the hold-down plate 30 or requiring that the hold-down screw 35 be removed. Therefore the disassembling of the timer unit 71 from the engine may be effected without disturbing the adjustment of the hold-down plate 30 with respect to the engine frame. Furthermore, since the suction controlled unit 41 remains assembled with the hold-down plate 30, it is not necessary to disconnect this unit from the pipe connection with the engine intake manifold.

While the embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. Apparatus for controlling the angular relation of an ignition timer unit with respect to its operating shaft comprising the combination of engine frame providing an opening or well, a timer unit having a shank received by the well and supported by the engine frame for rotation within the well and having a drive shaft extending within the unit to operate timing and distributing mechanism therein, said shaft carrying a gear within the engine frame meshing with an engine driven gear, a hold-down plate mounted on the frame and supported thereby for rotation concentrically with respect to the axis of the timer shank and shaft, means for securing the hold-down plate to the frame in the desired position of angular adjustment to provide an initial setting for the ignition unit, a clamp arm supported by the hold-down plate and adjustably secured to the shank of the ignition unit, a device for controlling ignition time in accordance with variations in engine load conditions and having a part located beneath the clamp arm and movable in response to variations in engine intake suction, detachable means for connecting said part with the clamp arm whereby movements of said part are imparted to the arm to rotate the timer unit with respect

to its shaft, and detachable means located above the clamp arm for limiting separation of the clamp arm from the hold-down plate.

2. Apparatus according to claim 1 in which the last mentioned detachable means comprises a coiled spring located above the clamp arm and bearing at its lower end against the clamp arm and, at its upper end, against a part connected with the hold-down plate.

3. Apparatus according to claim 1 in which the last mentioned hold-down means comprises a coiled spring surrounding a lug integral with the hold-down plate and extending through an opening in the clamp arm, said lug providing, above the clamp arm, a hook which receives a cross pin integral with the upper end coil of the spring, said spring bearing, at its lower end, upon the clamp arm, the spring being compressed to resist separation of the clamp arm from the hold-down plate, the compression of the spring serving to retain its cross pin portion in engagement with the hook portion of said lug, but further compression of said spring permitting release of the cross pin portion for said hook portion to permit removal of said spring and the ready removal of the timer unit from the engine frame with the clamp arm attached to the timer unit, after the clamp arm has been detached from the movable part of the engine suction responsive device.

JAMES L. ARTHUR.
HENDRIK A. G. BOLLER.