Oct. 1, 1935. C. H. DAVIS, JR 2,016,076

IGNITION APPARATUS

Filed April 21, 1932

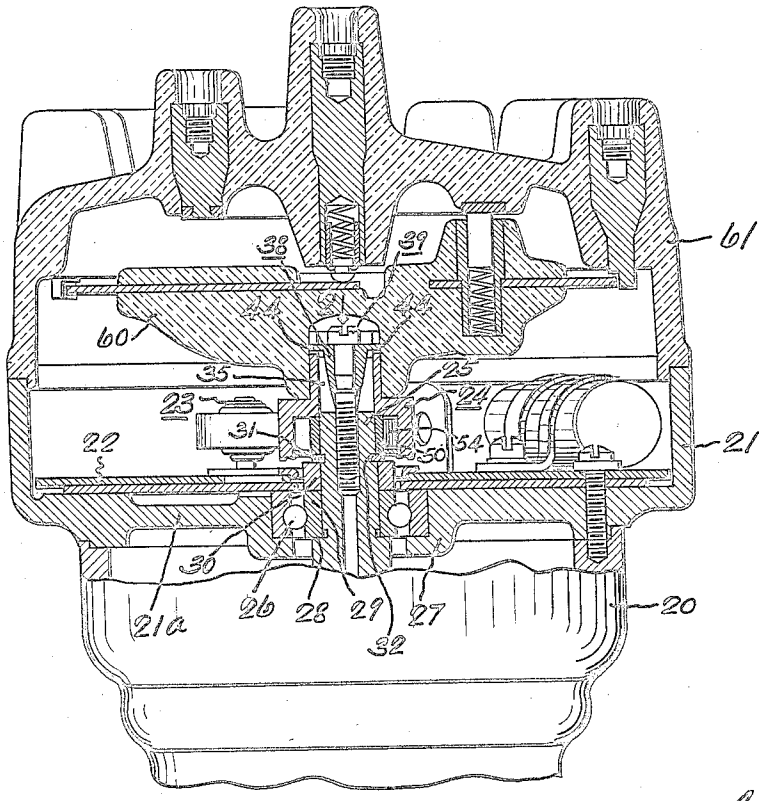


Fig. 1

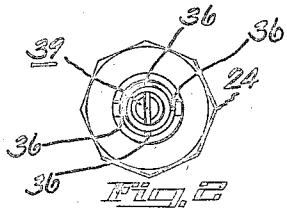


Fig. 2

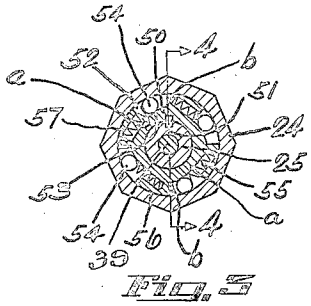


Fig. 3

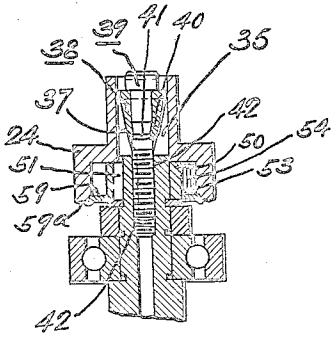


Fig. 4

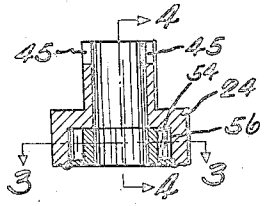


Fig. 5

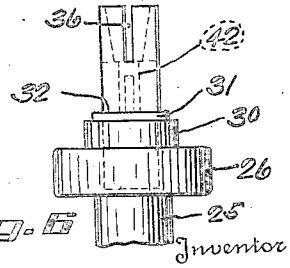


Fig. 6

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IGNITION APPARATUS

Charles H. Davis, Jr., deceased, late of Anderson, Ind., by John T. Fitzsimmons, administrator, Anderson, Ind., assignor, by mesne assignments, to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Application April 21, 1932, Serial No. 606,662

5 Claims. (Cl. 74—568)

This invention relates to ignition timers for internal combustion engines and one of its objects is to provide improved means for adjustably securing the timer cam to its driving shaft in such a way as to substantially resist a force which would tend to displace the cam angularly from said shaft. In the disclosed embodiment of this invention the object is accomplished by providing a one-way clutch connection between the cam shaft and the cam supported thereby said clutch being so arranged that it will transmit the driving force of the shaft to the cam in the direction in which the cam is to be driven. The one-way clutch provides means for adjusting the cam angularly with respect to the shaft. The cam is secured in the adjusted position by a clamping device which causes resilient fingers provided by the shaft to be forced into binding engagement with the interior wall of the hole of the cam through which the cam shaft extends.

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 one form of the present invention is clearly shown.

In the drawing:

Fig. 1 is a fragmentary view, partly in longitudinal section, of an ignition timer provided with a form of the present invention.

Fig. 2 is a fragmentary view looking in the direction of the arrow 2 of Fig. 1, the distributor rotor driven by the timer cam having been removed.

Fig. 3 is a sectional view on the line 3—3 of Fig. 5.

Fig. 4 is a sectional view on a line at right angles to the plane of the section of Fig. 5, and is a view on the section line 4—4 of Fig. 3 or 4—4 of Fig. 5.

Fig. 5 is a sectional view of the cam and clutch assembly on the same plane as its parts are shown in Fig. 1.

Fig. 6 is a side view of the assembly of the shaft and ball bearing.

In the drawing 20 designates a base supporting a timer housing 21 containing a plate 22 upon which is supported a circuit interrupter 23 operated by a cam 24 whose central bore receives a cam shaft 25 journaled upon a ball bearing 26 received by a cup-shaped portion 27 of the bottom wall 21*a* of the housing 21. The inner race 29 of the bearing 26 is retained upon a shoulder 28 of shaft 25 by a spacer 30 retained by a C-washer 31 engaging a groove 32 provided by the shaft 25.

The shaft 25 is provided at its upper end with four resilient spaced fingers 35 formed by sawing at 36 in Figs. 2 and 6 the tubular upper end of the shaft 25 which had previously been provided with an internal tapered wall thus providing each finger 35 with an internal tapered surface 37 (see Fig. 4). The surfaces 37 of the fingers 35 are engageable with a frusto-conical wedge 38 loosely surrounding a screw 39 and retained thereon by having a portion 40 of the wedge 38 forced loosely into a groove 41 provided by the screw 39. The screw 39 is received by a tapped central hole 42 in the shaft 25. The wedge 38 is provided with diametrically oppositely extending lugs 44 received by diametrically opposite notches 45 provided by the cam 24 in order to provide a splined connection between the wedge 38 and the cam 24. The tightening of the screw 39 causes the wedge 38 to press the fingers 35 against the internal surface of the central bore of the cam 24 thereby binding the cam 24 to the shaft 25 by force due to the binding friction between the internal surface of the wall of the cam 24 and the external surfaces of the fingers 35, and due to binding friction between the internal conical surface of the fingers 35 and the external conical surface of the wedge 38.

The present invention provides a means additional to the wedge 38 and fingers 35 for transmitting motion from the shaft 25 to the cam 24. This additional means is a one-way clutch connection between the shaft 25 and cam 24 which provides for adjusting the cam 24 relative to the shaft 25 while the screw 39 is loosened. This one-way clutch comprises an inner member 50 attached to the shaft 25 by a key 51 and provided with four notches 52 each notch being defined in part by cam surface 53 which is non-concentric with respect to the axis of the shaft 25 and which extends from a point *a* nearest to the shaft 25 to a point *b* more distant from the shaft 25. Each notch 52 receives a roller 54 urged by a spring 55 in a direction tending to urge the roller between the cam surface 53 and a cylindrical surface 56 provided internally of the cam 24. Each spring 55 is received within a hole provided by an arm 57 of the member 50. This one-way clutch is so constructed and arranged that it will transmit motion from the shaft 25 to the cam 24 in the direction of rotation of the cam 24 when operating the interrupter 23, but will permit rotating the cam 24 in the opposite direction when the screw 39 is

loosened in order to provide for adjusting the cam **24** relative to the shaft **25**.

The cam **24** supports and drives a distributor rotor **60** which cooperates with a distributor head **61** in the usual well known manner. Especially when the masses of the cam **24** and of the rotor **60** are relatively great, the torque placed upon the shaft **25** due to sudden acceleration of the shaft will be relatively great. Since the lever arm of this torque or turning moment between the shaft **25** and the cam **24** is relatively small, the turning force will be relatively great. Since the one-way clutch provides for the transmission of the turning force between the shaft **25** and cam **24** at a distance substantially greater than the distances from the axis of the shaft **25** to the internal and external surfaces of the fingers **35**, it is apparent that the major portion of the turning force between the shaft **25** and the cam **24** will be taken up through the one-way clutch, thereby relieving wedge **38** and fingers **35** of abnormal strains due to sudden acceleration of the shaft **25**.

The inner member **50** of the clutch is retained within the outer member provided by the cam **24** through the agency of a washer **59** attached at **59a** to the cam **24**. The member **50** is made so that it can be reversed thereby providing an adjustment for the other direction of rotation of the cam to operate the interrupter.

It has been found that cam slippage always occurs when accelerating the engine. That is, the cam tends to remain stationary while its drive shaft tends to move ahead thereby retarding the timing of the ignition. The one-way clutch makes it impossible for the cam to be turned opposite to the normal direction of rotation of the shaft. When the expansible screw **39** is loosened the timing can be adjusted by turning the cam relative to the shaft **25** in the direction of shaft rotation. For example if the timing is 10 degrees late the cam should be rotated 10 degrees ahead. If the timing is 10 degrees early the cam should be rotated ahead (360—10) degrees or 350 degrees which is the same as retarding the timing 10 degrees. After the timing is adjusted the screw **39** is tightened to lock the cam from turning in either direction.

While the form of 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. In a periodic circuit breaker the combination of a drive shaft having an end portion shaped so as to provide spaced, resilient fingers, a cam mounted upon said fingers, a wedge adapted to be moved axially and shaped so as to wedge the fingers against the interior wall defining a hole in the cam, a screw passing through the wedge and threadedly engaging the shaft, and a one-way clutch independent of said finger-and-wedge securing means transmitting motion from the shaft to the cam.

2. In a periodic circuit breaker the combination of a drive shaft having an end portion shaped so as to provide spaced, resilient fingers, a cam mounted upon said fingers, a wedge adapted to be moved axially and shaped so as to wedge the fingers against the interior wall defining a hole in the cam, a screw passing through the wedge and threadedly engaging the shaft, and a one-way roller-wedge clutch comprising an internal member connected to said shaft and the interior wall of the cam transmitting motion from the shaft to the cam.

3. In a periodic circuit breaker the combination of a drive shaft having an end portion shaped so as to provide spaced, resilient fingers, a cam mounted upon said fingers, a wedge having a spline connection with said shaft and adapted to be moved axially and shaped so as to wedge the fingers against the interior wall defining a hole in the cam, a screw passing through the wedge and threadedly engaging the shaft, and a one-way clutch independent of said finger-and-wedge securing means transmitting motion from the shaft to the cam.

4. In a periodic circuit breaker the combination of a drive shaft having an end portion shaped so as to provide spaced, resilient fingers, a cam mounted upon said fingers, a wedge having a spline connection with said shaft and adapted to be moved axially and shaped so as to wedge the fingers against the interior wall defining a hole in the cam, a screw passing through the wedge and threadly engaging the shaft, and a one-way roller wedge clutch comprising an internal member connected to said shaft and an external shell including a part of the cam transmitting motion from the shaft to the cam.

5. In a periodic circuit breaker the combination of a drive shaft having an end portion shaped so as to provide spaced, resilient fingers, a cam mounted upon said fingers, a wedge having a spline connection with said shaft and adapted to be moved axially and shaped so as to wedge the fingers against the interior wall defining a hole in the cam, a screw passing through the wedge and threadedly engaging the shaft, and a one-way roller wedge clutch comprising an internal member attached to that portion of the shaft into which said screw is threaded and comprising an external shell carried by said cam transmitting motion from the shaft to the cam.

JOHN T. FITZSIMMONS,
Administrator of the Estate of Charles H. Davis, Jr., Deceased.