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Hamburger

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[54] **EXTERNALLY ADJUSTABLE CAM TIMER**

[76] Inventor: **Edward O. Hamburger,** 6 Riverpark Dr., Brick Twp., Ocean County, N.J. 08723

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[52] **U.S. Cl.** ..... **74/243 PC**
[51] **Int. Cl.** **F16h 55/30**
[58] **Field of Search** ..... 74/243 PC

[56] **References Cited**

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1,578,983	3/1926	Gossett	74/243 PC
1,691,408	11/1928	Palmer	74/243 PC
2,314,969	3/1943	Birggs	74/243 PC
3,490,303	1/1970	Rosenberg	74/243 PC

Primary Examiner—Leonard H. Gerin
Attorney, Agent, or Firm—Murphy, Springberg & Clapp

[57] **ABSTRACT**

For providing cam timing, a sprocket wheel housed in a timing cover is attached to a cam shaft by means of an intermediate adjusting arm placed in a recess of the sprocket wheel. The adjusting arm is rigidly fixed to the cam shaft and moveably secured to the sprocket wheel. Adjustment of the relative angular positions of the sprocket wheel and the cam shaft is achieved by repositioning a screw in the adjusting arm which is inclined to the face of the sprocket wheel so as to facilitate its rotation without removal of the timing cover.

9 Claims, 3 Drawing Figures

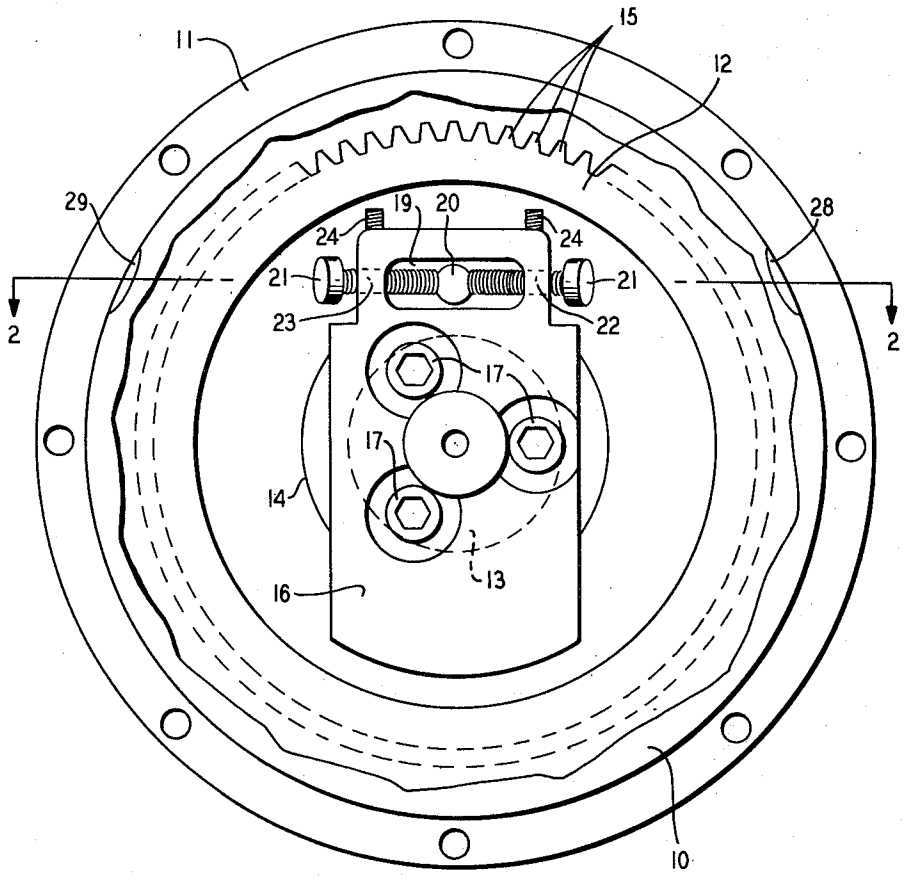


FIG. 1

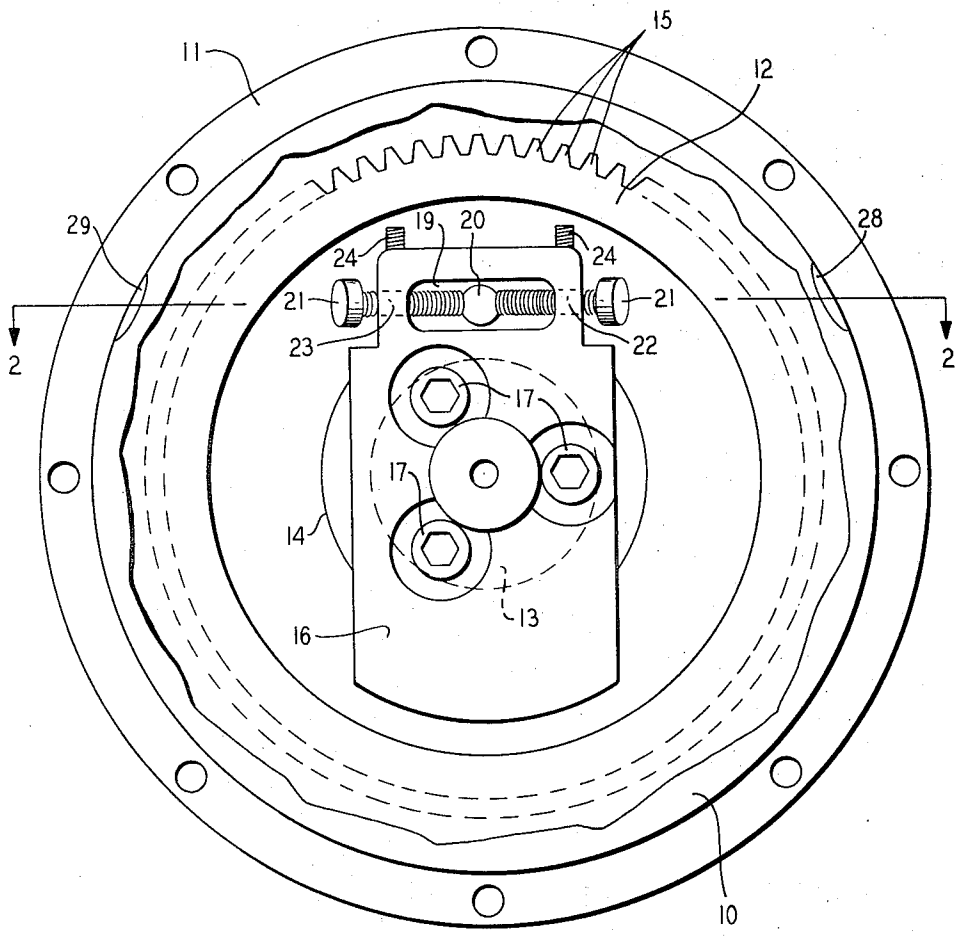


FIG. 2

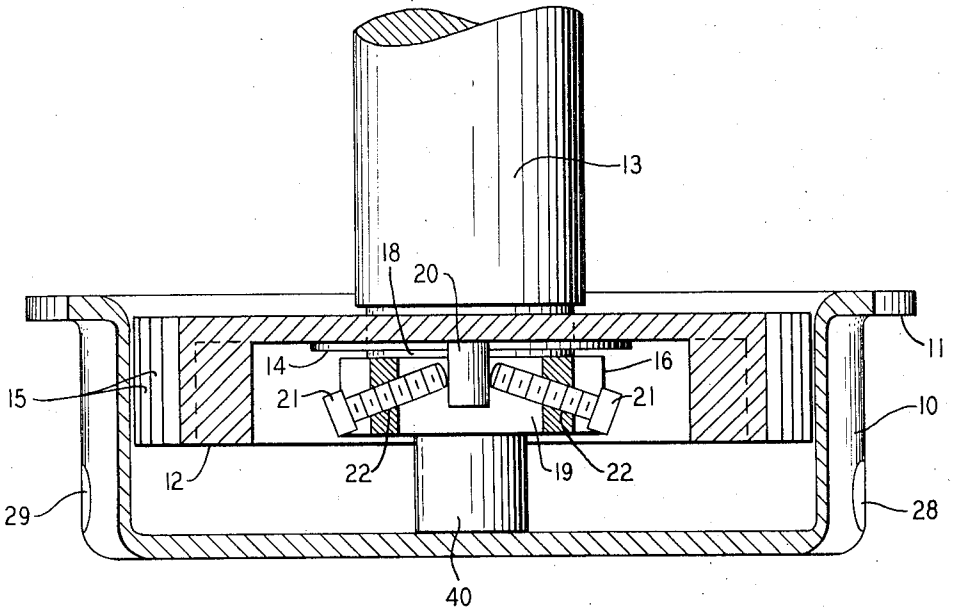
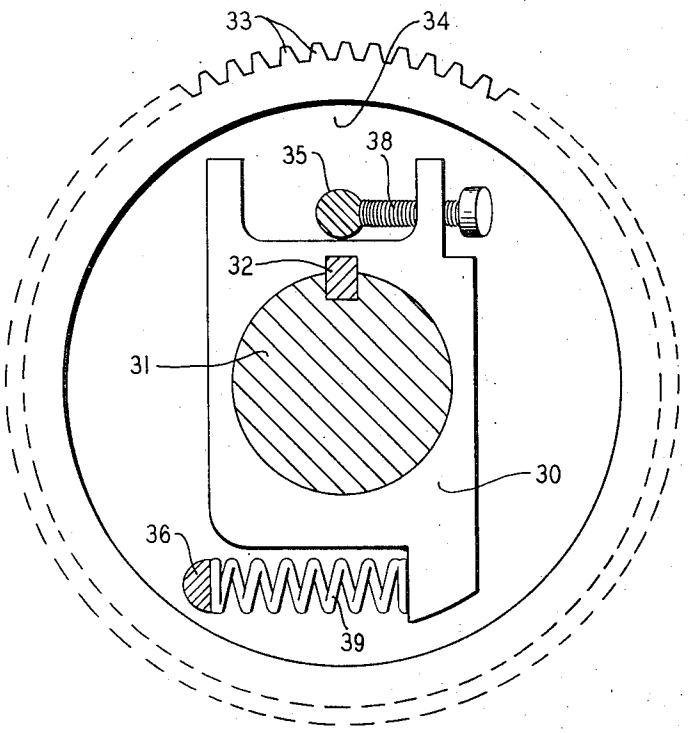

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FIG. 3


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EXTERNALLY ADJUSTABLE CAM TIMER

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to cam timing for reciprocating engines, and more particularly, to a cam timing assembly which can be readily mounted on the engine and adjusted without removing the timing cover.

2. Description of the Prior Art

In conventional reciprocating internal combustion engines, the cam shaft is secured to a drive sprocket wheel, the sprocket wheel is driven by a chain or gear linked to the drive shaft, and cam timing is established by fixing the relative position between the sprocket wheel and the cam shaft. When an engine is manufactured, a relative angular position is established between the sprocket wheel and the cam shaft and hence the cam timing is set. For pleasure driving, the engine manufacturer's setting is normally adequate.

For the racing enthusiast, however, higher engine performance is desired. Engine performance is a function of cam timing and, since cam timing is critical, it may be desirable to make frequent adjustments such as during or between races. Typically, the adjustment merely requires reorienting the sprocket wheel relative to the cam shaft. This adjusting procedure, however, conventionally entails removing the timing cover, which houses the cam shaft-sprocket assembly so as to achieve access to the end of the cam shaft, unfastening the sprocket wheel, reorienting the sprocket wheel with respect to the cam shaft and then resecuring the sprocket wheel to the cam shaft in its new position so as to either advance or retard the timing.

To speed the adjusting procedure, racing engines are often modified so that the sprocket wheel and the cam shaft are secured by dowel pins which can be removed and replaced in order to allow the cam shaft and sprocket wheel to be repositioned to a number of preselected orientations. Similarly, other proposals have also been made to facilitate adjustment of cam timing. For instance, U.S. Pat. No. 1,691,408, issued Nov. 13, 1928 to W. T. Palmer, discloses a two-part sprocket assembly designed to permit occasional timing adjustment necessitated by wear of engine parts, especially the chain which drives the sprocket wheel. The disclosed assembly consists of a hub secured to the cam shaft and an outer web which supports the sprocket teeth. When the timing cover is removed, the outer web can be rotated relative to the hub by means of set screws or a worm gear to achieve a new orientation. After the new orientation is established, the two parts are secured by cap screws.

While either the Palmer assembly or the dowel arrangement will provide quicker timing adjustments than is possible in conventionally manufactured engines, both require removal of the timing cover. Hence, the timing procedure may still be a lengthy process and often requires more than the few minutes available during or between races.

It is an object of the present invention, therefore, to reduce the time necessary to quickly and precisely adjust the cam timing of an engine.

Another object of this invention is to achieve necessary adjustments without removing the timing cover.

SUMMARY OF THE INVENTION

In accordance with the present invention, the cam shaft of a multicylinder internal combustine engine is adjustably secured to the drive sprocket wheel so that the relative angular positions of the two can be easily adjusted without removing the timing cover. The drive sprocket wheel is rotably mounted on the cam shaft, but is held in an adjustably fixed position by an adjusting arm which, in turn, is fixed to the cam shaft. The sprocket wheel and the adjusting arm are adjustably joined by means of at least one regulating screw which is threaded in a channel in the adjusting arm and bears upon a stop or lug which protrudes from the sprocket wheel.

The adjusting arm, which is secured to the end of the cam shaft in an orientation normal to the shaft's axis and parallel to the face of the sprocket wheel, is a relatively flat member located in a recess in the sprocket wheel. To adjust the relative angular positions of the sprocket wheel and cam shaft, the regulating screw must be rotated to alter the relative positions of the sprocket wheel and the adjusting arm.

According to one feature of this invention, the regulating screw is angled to the central plane of the adjusting arm so that the long axis of the regulating screw inclines out of the recess. As a result, the head of the regulating screw can readily be reached for rotation by a tool, such as a conventional screwdriver or allen wrench, without removing the timing cover. To this end, a hole in the edge of the cover provides access for the tool.

According to another feature of this invention, a pair of opposing regulating screws are employed so that the adjusting arm and the sprocket wheel can be securely fixed in a selected timing adjustment without additional retaining elements such as cap screws. Alternatively, a non-adjustable element, such as a spring may be used in place of one regulating screw to achieve secure positioning.

A better understanding of this invention will be facilitated by the following specification and drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a front elevation view of a cam timing assembly in accordance with the present invention and illustrates a timing cover with a portion broken away to show internal components.

FIG. 2 is a top plan view taken in section along the line 2—2 of the assembly of FIG. 1: and

FIG. 3 is a front elevation view of alternate embodiment of the invention.

DETAILED DESCRIPTION

FIG. 1 and 2 show a cam timing assembly protected by a timing cover **10** which has a flange **11** for fastening it to an engine block (not shown). The cover **10** is partially cut away to expose the components of the cam timing assembly. As best seen in FIG. **1**, the cam timing assembly includes a sprocket wheel **12** and an adjusting arm **16**. The sprocket wheel **12** includes a journaled hub **14** which cooperates with an annular ring of gear teeth **15** to form a central recess. The gear teeth **15** are adopted for mechanical linkage to a driver, such as a drive shaft (not shown).

The adjusting arm **16** is a substantially rectangular plate located in the central recess of the sprocket wheel

12 in a position substantially parallel to the face thereof. It is rigidly fixed to the cam shaft 13 by cap screws 17 and includes a shoulder 18. The shoulder 18 cooperates with the journaled opening in the hub 14 so as to provide a bearing surface upon which the sprocket wheel 12 can rotate. As best seen in FIG. 2, the journaled opening in the hub 14 advantageously has a diameter smaller than the diameter of the cam shaft 13. Consequently, when the adjusting arm 16 FIGS. attached to the cam shaft 13, the sprocket wheel 12 will be confined within a predetermined area. To facilitate operation, a thrust button 40 is installed between the adjusting arm 16 and the timing cover 10.

It will be understood that numerous other known mechanisms such as dowels or key assemblies can be used in addition to or in lieu of the cap screws 17 to rigidly connect the cam shaft 13 to the adjusting arm 16. In its most convenient form, it is anticipated that the invention will be produced as a modification kit containing the adjusting arm 16 and a replacement sprocket wheel 21. It is intended that the mechanism used by the engine manufacturer to secure the original sprocket wheel to the cam shaft will be used to attach the particular adjusting arm 16 supplied with the kit.

As best seen in FIG. 1, the adjusting arm 16 is formed with an open end or internal opening 19 located so that a lug or stop 20 protruding from the recess of sprocket wheel 12 extends into the opening 19. Two regulating screws 21, located respectively in appropriately tapped holes 22 in the adjusting arm 16 project into the opening 19 where they bear in opposition to each other against the stop 20. The opposing forces generated by the regulating screws 21, which should be of the self-locking type, secure the adjusting arm 16 and the sprocket wheel 12 in any desired relative position limited only by the travel of the regulating screws 21.

By fixing the position of the adjusting arm 16 relative to the position of the sprocket wheel 12, a particular cam timing is established. Thereafter, small adjustments of the relative angular positions of those two components will alter the timing and thereby effect changes in engine performance. The necessary small adjustments may readily be accomplished by backing off one regulating screw 21 and advancing the other an appropriate amount. For most convenient use, it has been found that the opening 19 should be sufficiently large to provide 20° of rotation on either side of "straight-up" and repositioning a regulating screw 21 by one turn should provide approximately a 4 degree or 5 degree adjustment.

In order to facilitate the desired small adjustments from the exterior of the engine, the timing cover 10 is perforated by two access holes 28 and 29. Both are located on opposite edges of the timing cover 10 in registration with the regulating screws 21 so that they can be rotated by an appropriate wrench or screwdriver inserted through the holes. Removable caps can be used to cover the access holes 28 and 29 when the desired adjustment is complete. If an engine is modified by a kit designed in accordance with the invention, it will be recognized that the holes 28 and 29 will have to be perforated in the timing cover 10 during the course of the modification.

As can best be seen in FIG. 2, the tapped holes 22 lie on paths angularly displaced or inclined from a central plane which passes through the center of the adjusting arm 16 and which is disposed in a position normal to the axis of the cam shaft 13 and substantially parallel to the face of the sprocket wheel 12. That inclination or angular displacement of the tapped holes 22 locates the long axes of the regulating screws 21 on a line extending from the stop 20 to a point beyond the periphery of the sprocket wheel 12. Moreover, it does so without intercepting that portion of the sprocket wheel 12 which contains the gear teeth 15. As a result, the regulating screws 21 can be repositioned from outside the timing cover 10. If the tapped holes 22 were not so inclined, but were parallel to the plane passing through the adjusting arm 16, the heads of the regulating screws 21 would be hidden behind the portion of the sprocket wheel 12 which contains the gear teeth 15 and removal of cover 10 would be necessary in order to achieve rotation.

The regulating screws 21 are conventional locking screws. If more positive locking is desired, however, a pair of locking set screws 24 can be included as shown in FIG. 1.

FIG. 3 illustrates an alternative embodiment of the invention. As shown therein, an adjusting arm 30 is secured to a cam shaft 31 by means of a key 32. A sprocket wheel 33 is rotably mounted on the cam shaft 31, and two lugs or stops 35 and 36 protrude from the sprocket wheel 33. Bearing against the stops 35 and 36 are a regulating screw 38 and a spring 39 each of which is attached to the adjusting arm 30. Both act in opposing directions so that the adjusting arm 30 and the sprocket wheel 33 are fixed relative to one another when their opposing forces are in dynamic balance.

As in the embodiment of FIG. 1, the relative position between the cam shaft 31 and the sprocket wheel 33 is adjustable by repositioning the regulating screw 38. The opposing spring 39 serves simply to maintain the desired adjustment. Where the adjusting arm 30 is located in a recess such as the one designated 34 in the sprocket wheel 33 as shown in FIG. 3, angular inclination of the screw 38 permits required access through a single access hole in a timing cover (not shown).

The foregoing embodiments are merely illustrative of the principles of the invention and numerous variations will be apparent to those skilled in the art without departing from the spirit and scope thereof.

What is claimed is:

1. In a cam timing assembly adapted for mounting on a shaft and including a wheel rotably mounted on said shaft, an adjusting arm disposed in coplanar relationship with said wheel within a central recess therein and rigidly fixed to said shaft and first projecting stop means for securing said adjusting arm in a selected position relative of said wheel, the combination comprising:

two regulating screws threaded through said adjusting arm to bear against opposite sides of said stop means, the position of said regulating screws in said adjusting arm adapted to establish said selected relative position; and

a cover enclosing said assembly and having an access hole in registration with each regulating screw, each regulating screw being inclined to the face of said wheel whereby repositioning of each regulating screw can be achieved externally to said cover through an access hole.

2. A cam timing assembly in accordance with claim 1 wherein each regulating screw is adapted to lock where it is positioned.

3. A cam timing assembly in accordance with claim 1 wherein said adjusting arm is rigidly fixed with its central plane normal to said shaft and the long axis of said regulating screw is inclined with respect to said central plane.

4. A cam timing assembly in accordance with claim 3 wherein each inclination is such that the long axis of said regulating screw lies on a line extending from said stop means to beyond the periphery of said wheel without intercepting the edge forming the demarcation between said recess and said wheel.

5. A cam timing assembly in accordance with claim 1 wherein said wheel is the drive sprocket and said shaft is the cam shaft of an internal combustion engine and repositioning said regulating screws alters the cam timing of the engine.

6. In a cam timing assembly adapted for mounting on a shaft and including a wheel rotably mounted on said shaft, an adjusting arm disposed in coplanar relationship with said wheel within a central recess therein and rigidly fixed to said shaft and first and second projecting stop means for securing said adjusting arm in a selected position relative to said wheel, the combination comprising:

at least one regulating screw threaded through said adjusting arm to bear against said first stop means, the position of said regulating screw in said adjusting arm adapted to establish said selected relative position;

a spring attached between said adjusting arm and said second projecting stop means so as to provide a force in opposition to that provided by said regulating screw; and

a cover enclosing said assembly and having an access hole in registration with said regulating screw, said regulating screw being inclined to the face of said wheel whereby repositioning of said regulating screw can be achieved externally to said cover through said access hole.

7. A cam timing assembly for installation in engines having a cam mechanism driven by a cam shaft comprising:

a sprocket wheel adapted for mounting on said cam shaft, said sprocket wheel having a central hub apertured to rotatably engage said cam shaft, a series of gear teeth disposed annularly to said hub, a web joining said hub and gear teeth and a lug projecting outwardly from said web, said web being displaced from the front face of said sprocket wheel to form a recess; and

a cam timing adjusting arm for mounting in said recess and including attaching means for fixedly connecting said arm to said cam shaft in parallel relationship to the face of said sprocket wheel and control means for regulating the relative angular displacement between said sprocket wheel and said cam shaft, said control means including at least one regulating screw engaging said lug and projecting through said adjusting arm at an angle to the face of said sprocket wheel such that the long axis of said regulating screw lies on a line extending from said lug to beyond the perifery of said wheel without intercepting the edge forming the demarcation between said recess and the front face of said sprocket wheel whereby access to said screw for adjustment is readily achieved from the rim of said sprocket wheel.

8. A cam timing assembly in accordance with claim 7 wherein said control means includes a pair of oppositely disposed regulating screws projecting through said adjusting arm at an angle to the face of said sprocket wheel.

9. A cam timing assembly in accordance with claim 7 wherein said control means includes a spring acting in opposition to said regulating screw.

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