Sept. 17, 1940. W. G. SCHNEIDER 2,215,301

TIMER GOVERNOR

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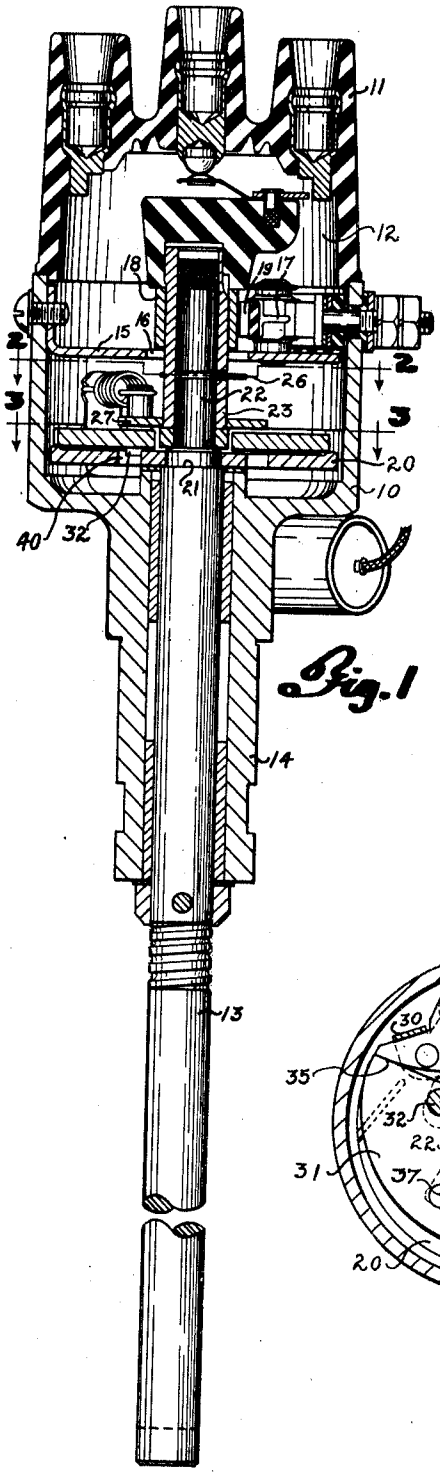


Fig. 1

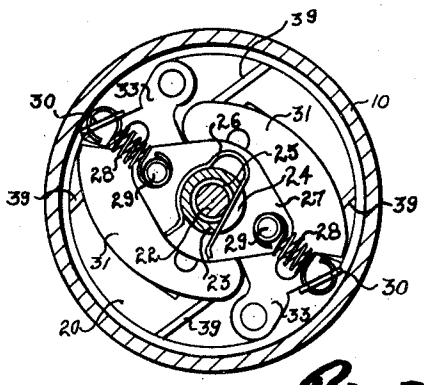


Fig. 2

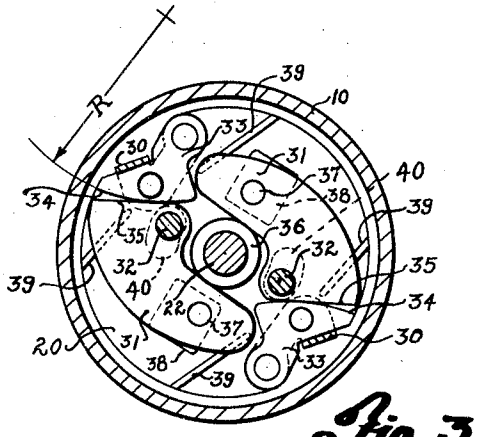


Fig. 3

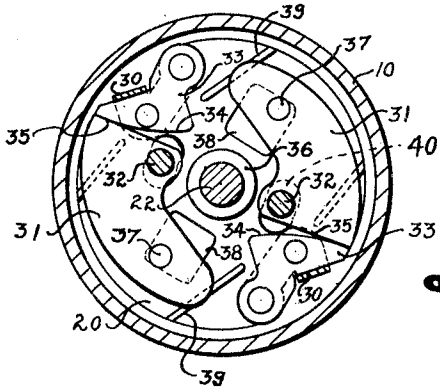


Fig. 4

INVENTOR
William G. Schneider
BY
Henry Stoltenberg
ATTORNEY

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TIMER GOVERNOR

William G. Schneider, Toledo, Ohio

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8 Claims. (Cl. 64—25)

This invention relates to appliances for use with an internal combustion engine in which ignition devices are employed, more particularly the invention relates to timer and distributor devices on multi-cylinder engines for the distribution of the ignition current.

It is well known in the art to use centrifugal weights to control the timing of an automotive engine in proportion to speed and it has been found desirable to give the weights under the action of centrifugal force an opportunity to employ a rolling action instead of a sliding action. If the centrifugal weights act by a rolling action, there is greater likelihood that their movements will be uniform and smooth throughout the whole range of speeds at which the governor must operate. Whereas if a sliding action were used, as is shown in the prior art, there is a tendency on the part of the moving parts to bind at the low speeds or to move in a series of steps in the nature of jerks thereby destroying effective action of the governor.

In order that the parts employed in the fabrication of the governor disclosed may be easily manufactured through the simplest and cheapest processes, an arrangement of parts has been employed in which simple curves and straight lines may be employed to obtain the camming action to displace the parts under the action of centrifugal force during rotation. This method of manufacturing will insure cheapness and reduce the cost of the completed article.

It is a further object to provide an ignition timing governor which will employ a rolling action in the process of advancement of the timing under influence of the centrifugal force of the rotating weight rather than a sliding action.

It is a further object of this invention to provide an ignition timing governor in which the interacting surfaces of the centrifugal advancing mechanism will employ simple curves and planes so that the governor can be cheaply fabricated for a mass market.

Other objects and advantages of this invention relating to the arrangement, operation and function of the related elements of the structure, to various details of construction, to combinations of parts, and to economies of manufacture, will be apparent to those skilled in the art upon consideration of the following description and appended claims, reference being had to the accompanying drawing forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

Figure 1 is a sectional elevation of a distributor assembly.

Figure 2 is a sectional elevation taken along the line 2—2 of Figure 1.

Figure 3 is a sectional elevation taken along the line 3—3 of Figure 1, showing the weights in retracted position.

Figure 4 is a sectional elevation taken along the same line as Figure 3, showing the weights in extended position.

Referring to Figure 1, there is shown a complete distributor assembly including a housing 10, an insulating cap 11 fitted on the top thereof, so as to form a chamber 12. A driving shaft 13 is journaled in a boss 14 on the base of the housing 10, the upper end of the shaft 13 being in communication with the chamber 12 for purposes of driving the distributor parts. The lower end of the shaft 13 is directly connected to a motor means with which it is to cooperate. The housing 10 may be attached to the motor means through the medium of the boss 14 in any convenient manner.

The chamber 12 in the distributor housing 10 is divided into an upper and lower compartment by means of the diaphragm 15, which has a centrally located aperature 16 through which projects the upper end of the shaft 13. In the upper compartment there is positioned the contact breaker arm 17, a cam 18, and a cam rider 19, the rider being positioned to cooperate between the cam and the contact point arm 17. These parts may be of any suitable type of construction as is well known in the art. In the same compartment there is located high tension distributor means, formed with parts cooperating between the shaft 13 and the insulating cap 11. These parts are well known and need not be described in detail.

In the lower compartment there is positioned a governor mechanism positioned upon a plate 20 which is rigidly attached to the shaft 13 by cooperating with the shoulder 21, the shaft 13 continuing thereabove to form an elongated stud 22 which extends through the aperture 16 to a point above the diaphragm 15. The governor mechanism positioned in the lower compartment cooperates with the cam 18 and the high tension distributing parts by means of the sleeve 23, which is journaled on the elongated stud 22. The cam 18 is rigidly attached to the sleeve 23 at a point immediately above the diaphragm 15. The sleeve 23 is held in position on the stud 22 by a clip means comprising a slot 24 (Figure 2) in the sleeve 23 cooperating with an annular groove 25

in the elongated stud 22, and a clip 26 which embraces the sleeve 23, the clip having a straight portion which cooperates with the slot 24 and the annular groove 25 to hold the sleeve 23 in position against axial movement with regard to the elongated stud 22 and at the same time allow rotation of the sleeve.

On the lower end of the sleeve 23, a plate 27 is rigidly attached, the plate being positioned in spaced relation with the first mentioned plate 20 on the shaft 13. The plate 27 cooperates with the plate 20 through the means of resilient springs 28 which allow limited rotation on the part of the sleeve 23 with reference to elongated stud 22. The springs 28 at all times tend to urge the sleeve 23 and the plate 27 to the position shown in Figure 2. This resilient connection can be obtained by any convenient means as, for example, by studs 29 positioned above the plate 27 and brackets 30 positioned on the plate 20.

Positioned between the plate 27 and the plate 20 are centrifugal weights 31, the spaced relation between the plates being such that the weights 31 may move in a radial direction about the shaft 13 parallel to plate 20. The weights 31 cooperate with the plate 27 by being pivoted on depending studs 32 on the plate, which may be, if preferred, integral with the studs 29. The fact that the weights 31 are pivoted on the plate 27 gives the sleeve 23 carrying the cam 18 considerable weight which increases the inertia thereof and prevents the cam rider 19, when moving from high to low points on the cam 18, from causing a chattering during rotation of the shaft and its parts. With the high inertia value of the sleeve 23 and its cooperating parts, the varying force of the cam rider 19 to resist rotation of the sleeve is moving from a low point to a high point on the cam and the constant urge of the resilient connection in an opposite direction will be equalized through the reluctance of the weight of the sleeve to sudden movements, hence smooth rotation and quiet action are obtained.

The centrifugal weights 31 cooperate with the plate 20 through the medium of cam blocks 33 securely positioned near the periphery of the plate. The cam blocks 33 may be riveted to the plate 20 as shown in Figure 3, the same rivets being used to hold the brackets 30 in position. The cam blocks 33 are provided with a camming surface 34 to cooperate with a flat surface 35 on the weight 31. The cam surface 34 on the cam block 33 is a true radius, and the surface 35 on the weight 31 is a true plane. Clearly, the true radius may also be positioned on the weight 31, while the plane surface may be formed on the cam block 33. These simple geometric surfaces are employed so that parts are easily and cheaply manufactured in large quantities for fabrication of the governor mechanism.

The cam blocks 33 are positioned on the plate 20 to cooperate with the weights 31 in such a manner as to provide a rolling action between the cooperating surfaces 34 and 35, in order that the action of the governor will be smooth at all speeds at which it must operate. The collapsed position of the governor is shown in Figure 3 as defined by the contact of the inner edge of the weight 31 and the collar 36 on the elongated stud 22, while the extended position thereof is shown in Figure 4 as limited by the interaction of the depending stud 37 on the weight 31 and the side of the hole 38 struck out from the plate 20.

Referring to Figure 3, the lever system employed in this construction to displace the sleeve 23 acts about a pivot which is the depending stud 32 on the plate 27, one arm of the lever acting through the medium of the surface 35 against a fulcrum located at the point of contact between the cam surface 34 and the plane surface 35, the other arm of the lever acting between the fulcrum and the center of gravity of the weight when influenced by centrifugal force. It is clear that as the positions of the weights 31 change from that position shown in Figure 3 to the one shown in Figure 4, the ratios of the levers acting about the fulcrum change in a proportion which gives the weight 31, as acted upon by centrifugal force under rotation, a smaller mechanical advantage to move the sleeve 23 about the elongated stud 22 to change, for example, the timing relations of the distributor system.

The position of the cam block 33 on the plate 20, controlling the fulcrum, the movement of the pivot 32 about the shaft, the change of the position of the center of gravity in the weights, bring this relation about. It is desirable to give the lever system a diminution of mechanical advantage in some proportion as the centrifugal force increases with change of speed of rotation so that substantially a straight line curve will be obtained to show the relation between the angular displacement of the sleeve 23 and the speed of rotation of the shaft 13. To attain this end and at the same time use simple geometric surfaces on the interacting surfaces 34 and 35, the factors controlling the situation must be balanced against one another to attain the desired combination.

The plate 20 is of such size that it may rotate freely within the housing 10 and has on its upper surface stuck-up portions 39 which decrease the resistance between the lower surface of the centrifugal weights 31 and the upper surface of the plate 20 so that the weights may move readily from collapsed to extended position with the least amount of friction. The plate 20 has holes 40 which are positioned so that the depending studs 32 may move freely without interference from the plate 20.

The brackets 30 which form the anchor for the springs 28 are in their nature adjustable so as to increase or decrease the tension of the springs, as they may be bent away or toward the central shaft 13 to accomplish this purpose. It is desirable to be able to control the tension of these springs as they materially affect the force necessary to displace the weights.

I claim:

1. In an ignition timing governor, a driving shaft, driven means cooperating with the driving shaft and adapted to be advanced angularly therewith, centrifugal means acting between the driving shaft and the driven means, variable fulcrum means rigidly fixed on the shaft, variable lever means acting on the driven means and the fulcrum to effectuate the centrifugal means with varying mechanical advantages to advance the driven means, and resilient means to constrain the action of the centrifugal means.

2. In an ignition timing governor, a driving means, a driven means adapted to be advanced angularly with the driving means, centrifugal means acting between the driving means and the driven means to advance the driven means angularly with the driving means, a plane surface on the centrifugal means, a cylindrical surface on the driving means to cooperate with the plane surface on the centrifugal means to form a fulcrum, and supporting means for the cylin-

drical surface formed completely inside the cylinder bounding the cylindrical surface.

3. In a governor, driving means, driven means cooperating with the driving means and adapted to be advanced in varying angular relation therewith, centrifugal means pivotally mounted on the driven means and adapted to advance the driven means, resilient means to restrain the action of the centrifugal means, a plane surface on the centrifugal means disposed thereon to place the centrifugal means on one side thereof, and a surface on the driving means cooperating with the plane surface and adapted to contact the plane surface on the centrifugal means at an increasing distance from its pivotal point to form a fulcrum as the centrifugal means swings outwardly during rotation.

4. In a governor, driving means, driven means cooperating with the driving means and adapted to be advanced in varying angular relation therewith, centrifugal means mounted on the driven means and adapted to advance the driven means, resilient means to restrain the action of the centrifugal means, a plane surface on the centrifugal means, a cylindrical surface on the driving means adapted to cooperate with the plane surface to form a fulcrum to enable the centrifugal means to advance the driven means with the driving means, and supporting means for the cylindrical surface formed inside of the cylinder bounded by the cylindrical surface.

5. In a governor, a driving shaft, driven means cooperating with the shaft and adapted to be advanced in varying angular relation therewith, centrifugal means acting between the shaft and the driven means to advance the driven means in proportion to the speed of rotation of the centrifugal means, resilient means to restrain the centrifugal means, plane-surface means, cylindrical-surface means, the plane-surface means and the cylindrical-surface means cooperating together between the driven means and the shaft to enable the centrifugal means to fulfill its function, supporting means for the plane-surface means disposed on one side of the plane-surface means, and supporting means for the cylindrical surface means disposed completely inside of the cylinder formed by the cylindrical-surface means.

6. In a device of the class described, a driving means, driven means cooperating with the driving means and adapted to be advanced angularly therewith, centrifugal means acting between the driving means and the driven means, a substantially circular supporting plate on the driving means, variable fulcrum means on the supporting plate comprising a cylindrical surface whose center of curvature is outside the perimeter of the supporting plate, variable lever means acting on the driven means and the fulcrum means to effectuate the centrifugal means with varying mechanical advantages to advance the driven means, and resilient means to constrain the action of the centrifugal means.

7. In a device of the class described, a driving means, a driven means cooperating with the driving means and adapted to be advanced angularly therewith, centrifugal means acting between the driving means and the driven means to advance the driven means angularly with the driving means, a substantially circular supporting plate on the driving means, a cylindrical surface on the supporting plate having its center of curvature outside the perimeter of the plate and forming a variable fulcrum, and a surface on the centrifugal means to cooperate with the cylindrical surface, forming the fulcrum to effectuate the centrifugal means with varying mechanical advantages to advance the driven means.

8. In a device of the class described, a driving means, driven means cooperating with the driving means and adapted to be advanced angularly therewith, centrifugal means acting between the driving means and the driven means to advance the driven means angularly with the driving means, resilient means to restrain the centrifugal means, a supporting plate on the driving means, cylindrical-surface means on the plate having its center of curvature outside of the perimeter of the plate, supporting means for the cylindrical-surface means disposed completely inside of the cylinder formed by the cylindrical surface means and substantially within the perimeter of the supporting plate, a surface means on the centrifugal means to cooperate with the cylindrical-surface means to effectuate the centrifugal means with varying mechanical advantages to advance the driven means.

WILLIAM G. SCHNEIDER.