July 30, 1935. M. MALLORY 2,009,936

IGNITION GOVERNOR

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Fig. 1.

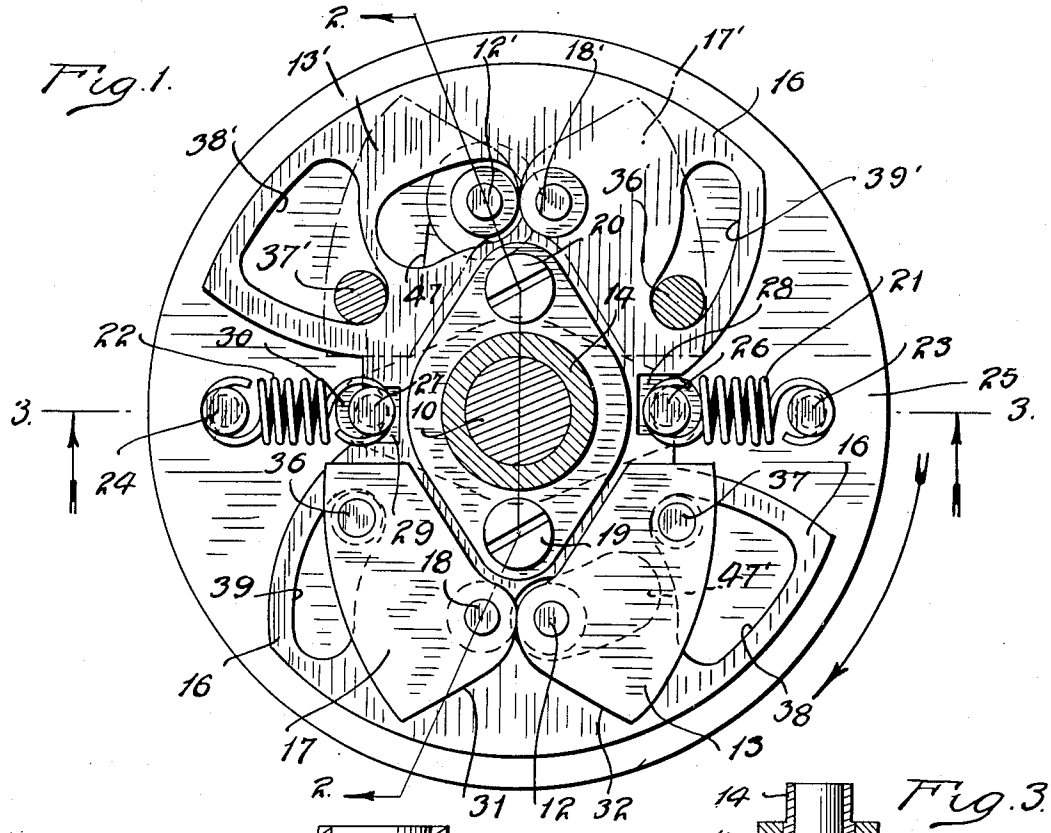


Fig. 2.

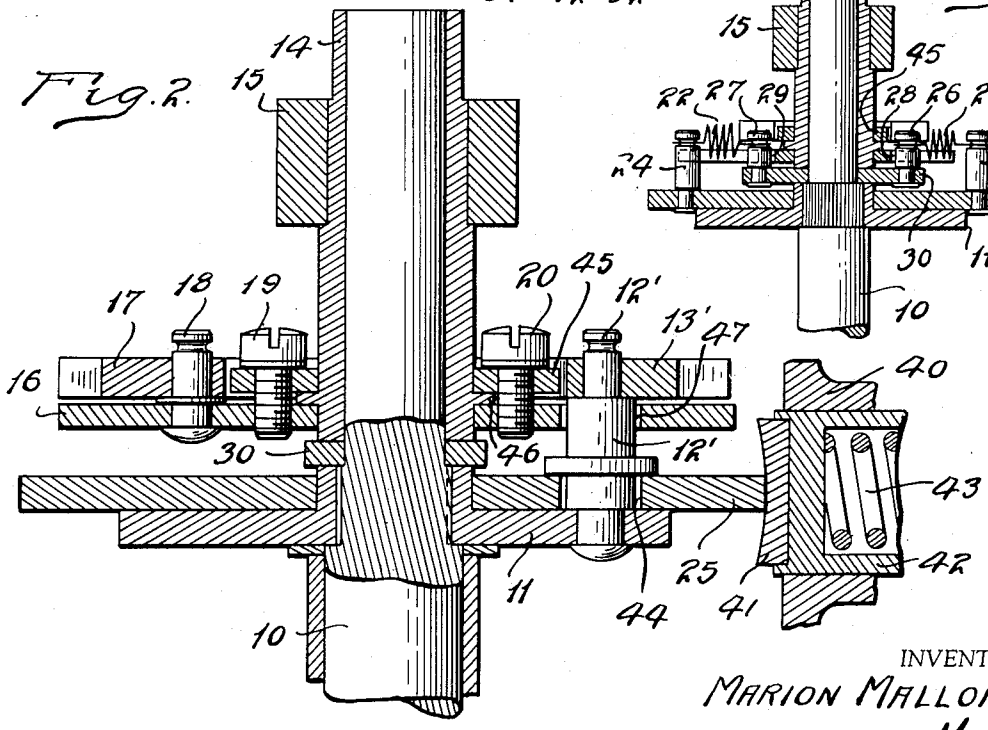


Fig. 3.

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Fig. 4.

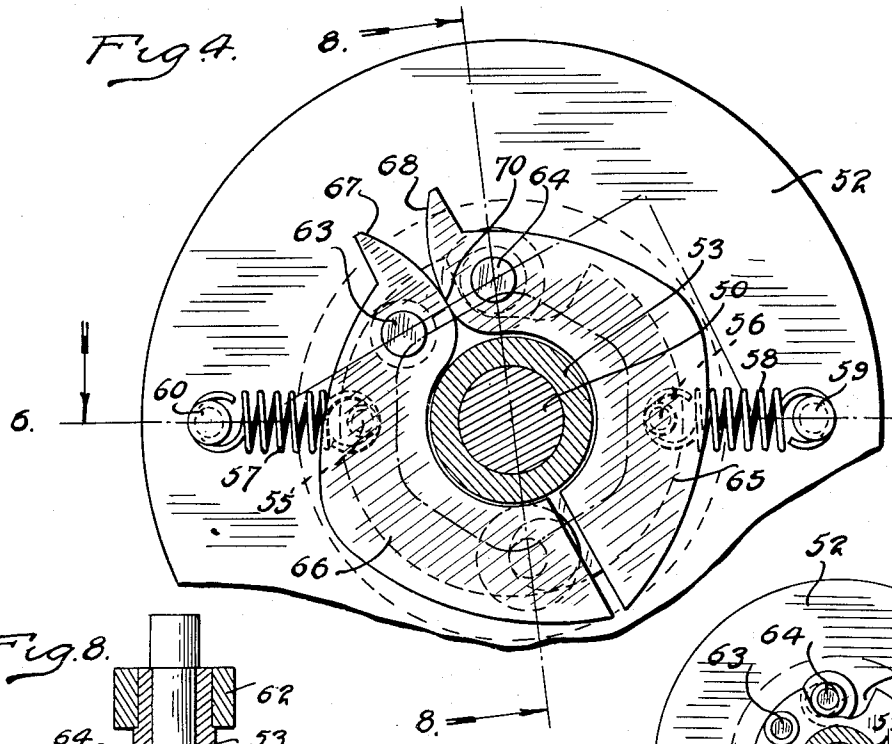


Fig. 5.

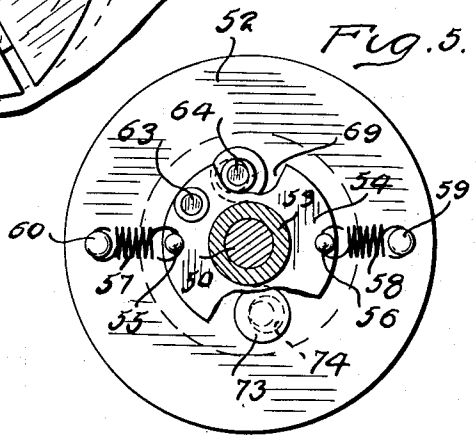


Fig. 8.

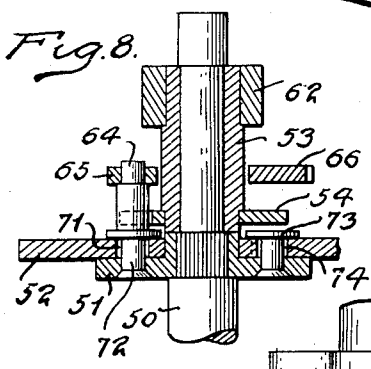


Fig. 6.

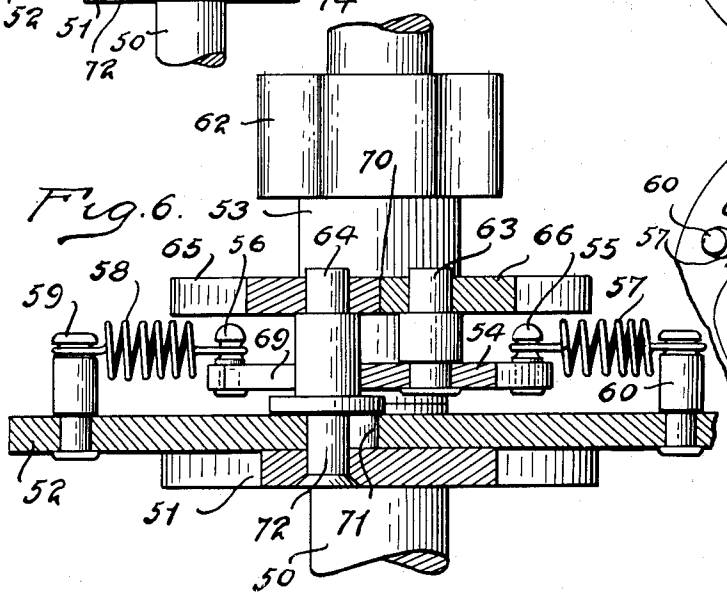
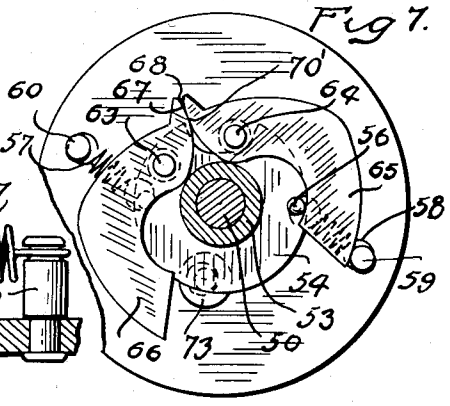


Fig 7.



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Patented July 30, 1935 2,009,936

UNITED STATES PATENT OFFICE

2,009,936

IGNITION GOVERNOR

Marion Mallory, Detroit, Mich.

Application May 28, 1934, Serial No. 727,887

7 Claims. (Cl. 64—90.5)

The object of this invention is to provide an ignition governor that is small in size and will start to expand or advance at very low R. P. M.

Another object is to provide an ignition governor that is controllable at all engine speeds. In other words, a governor that will start to expand at a low R. P. M., and will not be completely expanded until the R. P. M. reaches four or five thousand, if desired.

Another object is to provide an ignition governor that has no friction between the centrifugal elements and the cam; a governor with a complete rolling action instead of one with a mixed rolling and sliding action.

It has heretofore been difficult to make possible an early start and late finish in a governor because, if an early start was desired, heavy weights have been used. As the speed increased, these weights became so powerful that the governor would finish at an earlier R. P. M. than was desired. If stiffer springs were used to prevent this early finish, then the governor would not start to expand at as low a speed as desired. In other governors, where only two weights are used, it is necessary to use a long weight, so that the governor will have sufficient power to start at an early R. P. M. Of course, when a weight is used that is long, it has too much power at high speeds and is hard to control.

In the preferred form of my governor, I use four short weights instead of two. These four give sufficient power for an early advance, and the power diminishes as they move around their pivots, because they are short and so proportioned as to automatically counteract or reduce their own effect on the ignition advance.

An additional object is to reduce the friction of the governor mechanism to a minimum.

Fig. 1 shows a plan view looking down on Fig. 2.

Fig. 2 shows a cross-sectional elevation of plane 2—2 of Fig. 1.

Fig. 3 shows a cross-sectional elevation of plane 3—3 of Fig. 1.

Fig. 4 shows a plan view of a governor embodying the invention in its simplest form.

Fig. 5 shows the same governor with the two centrifugal weights removed.

Fig. 6 shows a cross-sectional elevation taken on plane 6—6 of Fig. 4.

Fig. 7 shows a plan view showing the governor weights in their extreme position.

Fig. 8 shows a cross-sectional elevation on the plane 8—8 of Fig. 4.

In the Figures 1, 2 and 3:—

10 is the driving shaft upon which is piloted the driven shaft 14, which carries the timer cam 15. The driving shaft 10 carries the driving plate 11 to which is loosely connected a control plate 25; these two plates being connected together by the pins 12 and 12'. The pin 12' is shown with a clearance 44, so that there is a limited angular movement between the two plates 25 and 11. Mounted on the pins 12 and 12' are the governor weights 13 and 13'. A driven plate 16 is bolted to the driven shaft 14 by the cap screws 19 and 20 and the washer 45. Mounted on this driven plate 16 are two pins 18 and 18', upon which are mounted the centrifugal weights 17 and 17'. Coil springs 22 and 21 are anchored onto a control plate 30, (loosely mounted on the driving shaft 10,) and provided with two pins 27 and 26. The other ends of the coil springs 21 and 22 are anchored to the plate 25 by means of the pins 24 and 23. The pins 26 and 27 loosely engage with the driven plate 16; there being clearance shown at 28 and 29, permitting a small angular movement between the plate 30 and the driven plate 16. Pins 36, 36', 37 and 37' project from the respective centrifugal weights into slots 38, 38', 39 and 39', thereby limiting the outward movement of the weights.

A friction device is shown on the right of Fig. 2, comprising a cylinder 40, a piston 42, a spring 43 and a friction pad 41. This piston may be operated by vacuum but this feature is not included in this application as it has already been covered.

In the Figures 4, 5, 6, 7 and 8:—

50 is the driving shaft rigidly connected to the two plates 51 and 52. In this case, these two plates are shown connected together by the pins 72 and 73, having the clearances 71 and 74 in the plate 52. This play between the plates 51 and 52, however, can be eliminated. 59 and 60 are two pins projecting from 52. To them are connected two coil springs 57 and 58. These two springs are anchored to the pins 55 and 56, which are mounted on the driven plate 54. This driven plate 54 carries a governor pivot 63. The plate 52 carries a governor pivot 64, upon which are mounted the governor weights 65 and 66, having cam surfaces 67 and 68, which engage with each other at the contact line marked 70 in Fig. 4 and 70' in Fig. 7. Rigidly connected to the plate 54 is the driven shaft 53 and the timing cam 62. The pin 64 moves in the gap 69 in the plate 54, which limits the number of degrees the ignition can be advanced.

Operation

In the operation of this governor, as shown in Figs. 1, 2 and 3, the weights **17** and **13**, under the action of centrifugal force, roll on each other and the contact point between the cam faces, which are numbered **31** and **32**, progressively advances out from the center of the governor. The pivot **12** pushes the pivot **18** ahead, and thereby advances the ignition.

So far, the function of the clearances **44** and **28** have been ignored. The function of the clearance **44** is to permit the application of friction to the disc **25**, causing the governor advance to be delayed so that a higher revolution per minute is necessary to obtain the same angular advance when the friction is applied than is the case when the friction is removed by withdrawing the piston **42**. The control of the governor by friction with or without the aid of the vacuum in the inlet manifold is the object of the following patents: #1,896,714, #1,866,896, #1,859,309 and application Serial No. 610,123.

The function of the clearance **28** is to provide an initial "hop". The cam **15**, which operates a circuit breaker (not shown) necessarily has friction developed on the surface of the cam. This friction has a tendency to prevent the ignition advancing, but very early in the revolution of the engine, the centrifugal force of the weights **13** and **17** overcomes the friction at **15**, and the clearance **28** is taken up, and thereupon the spring **21** immediately comes into action and opposes the advance of the ignition by means of the governor. In other words, the governor weights are balanced by the spring tension.

The operation of the governor is shown in its simplest form in Figs. 4, 5, 6 and 7. In these figures, it is clearly shown that the driving shaft **50**, through the driving plate **51** and pivot pins **63** and **64**, drives the shaft **53**. The radial springs **57** and **58** yield when the governor weights **65** and **66** fly out and separate the two pivots **63** and **64**.

As the governor weight **66** is mounted on the pivot **63**, which is on the driven plate **54**, and, as the governor weight **65** is mounted on the pivot **64**, which is integral with the control plate **52**, it follows, therefore, that, as the two pivots **63** and **64** are separated by the influence of centrifugal force acting on the weights **65** and **66**, the angular distance between **63** and **64** increases and the ignition is advanced, assuming that the clearances **71** and **74** have been eliminated.

It follows, therefore, that, by designing the cam surfaces **67** and **68**, it is possible to arrange that the contact line **70** moves out to the position shown in **70'** in Fig. 7, and thus the centrifugal leverage exerted by the centrifugal force diminishes so that the centrifugal force is less effective as the contact line **70** moves away from the center of the governor, and, hence, the springs become relatively stiffer or more effective in overcoming the action of the centrifugal force.

I have discovered that with this type of governor, it is essential that the contact line between the two governors moves out from the center in order that the governor has the correct characteristic required for controlling the ignition advance in an automotive internal combustion engine.

It will be noted that these weights roll against each other without any friction. In all governors, with which I am familiar that have heretofore been used, the governor weights roll over and slip over a fixed cam. Where the governor weights move over each other, poor rolling can be substituted for mixed rolling and slipping, which introduces friction and what is more important, an uncertain amount of friction which cannot be regulated and hence cannot be provided for in the design of the governor.

It will also be noticed that the contact line **70** can be arranged substantially at the same radial distance from the center of the driving and driven shafts as are the pivots **63** and **64**. By arranging these three points on the same circle, it is obvious that the centrifugal force has a great leverage at low engine speeds, which rapidly diminishes as the contact line **70** moves out from the center of the shaft, which gives the desired characteristic to the governor curve.

What I claim is:—

1. In an ignition governor, the combination of a driving shaft, a driven shaft coaxial therewith, a driving plate connected to the driving shaft and having two pivots normal to the plane of said plate and arranged diametrically opposite to each other, two governor weights rotatably mounted on said pivots, a driven plate connected to the driven shaft and having two pivots normal to the plane of said plate and arranged diametrically opposite to each other, two centrifugal weights rotatably mounted on said pivots, said weights having cam surfaces engaging with each other, spring means connecting the two plates together and opposing the centrifugal force acting on the weights, which tend to cause the two pairs of governor pivots to separate from each other and thus rotate the two plates relative to each other.

2. In a centrifugal governor, having a driving shaft, a sleeve freely rotating thereon, an ignition cam mounted on said sleeve, an even number of centrifugal members, half of these members pivoted onto the driving shaft, the other half pivoted onto the sleeve, cam surfaces on the centrifugal members, the pivots being arranged so that the centrifugal members mounted on the driving shaft engage with the centrifugal members mounted on the sleeve, the lines of contact between said members being adapted to move away from the center of rotation as the speed of rotation increases, whereby the increasing effective force exerted by the centrifugal members to advance the ignition is automatically counteracted at high speed.

3. In an ignition governor, a driving member, a driven member coaxial therewith and mounted for relative advance movement with reference to the driving member, governor weights pivotally mounted on the respective members with their axes parallel to the axis of said members, said weights having cam surfaces in rolling contact with each other, the contacting points of the surfaces being progressively farther from the pivots of the weights as the latter move outwardly about their pivots under the influence of centrifugal force, thereby imposing a resistance of increasing leverage to such movement.

4. In an ignition governor, a driving shaft, a driving plate rigidly connected thereto, a control plate mounted for limited rearward movement with reference to the driving plate, a driven plate mounted for limited advance movement with reference to the driving plate, centrifugal means to cause such advance movement, means including a spring connecting the control plate to the driven plate and adapted to oppose relative advance of the latter, and means to apply resistance

to the control plate to increase the resistance of the spring which is applied to the driven plate.

5. In an ignition governor, a driving shaft, a driving plate rigidly connected thereto, a driven plate, centrifugal means to advance the driven plate with reference to the driving plate, a control plate having a lost motion connection with the driven plate, and means including an initially radial spring connecting the driving member with said control plate.

6. In an ignition governor, a driving shaft, a driving plate rigidly connected thereto, a driven plate, centrifugal means to advance the driven plate with reference to the driving plate, a control plate having a lost motion connection with the driving plate, means including an initially radial spring connecting the driven member with said control plate, and means operable under predetermined conditions to resist rotation of said control plate.

7. In an ignition governor, a driving shaft, a driving plate rigidly connected thereto, a driven plate, centrifugal means to advance the driven plate with reference to the driving plate, a control plate having a lost motion connection with the driven plate, a second control plate having a lost motion connection with the driving plate, an initially radial spring connecting the two control plates, and means operable under predetermined conditions to resist rotation of the second control plate.

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