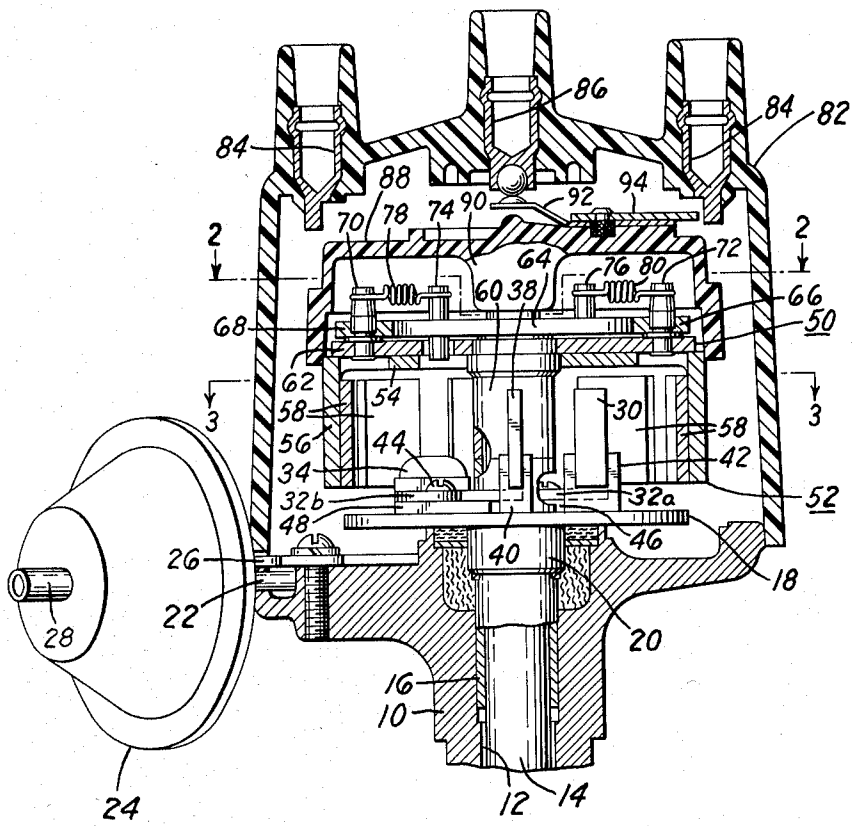
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MAGNETIC PULSE GENERATOR WITH CUP-SHAPED ROTOR MEMBERS

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Fig. 1



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Fig. 2

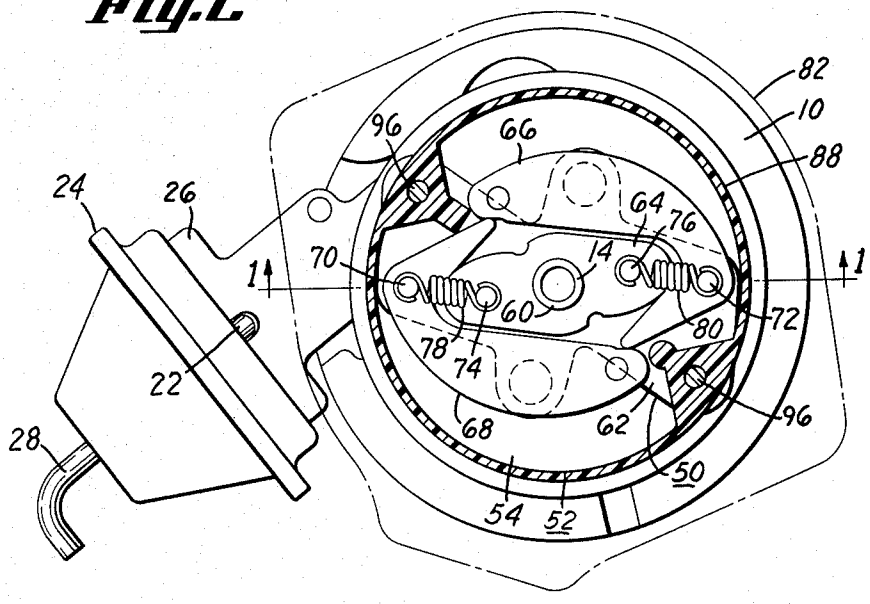
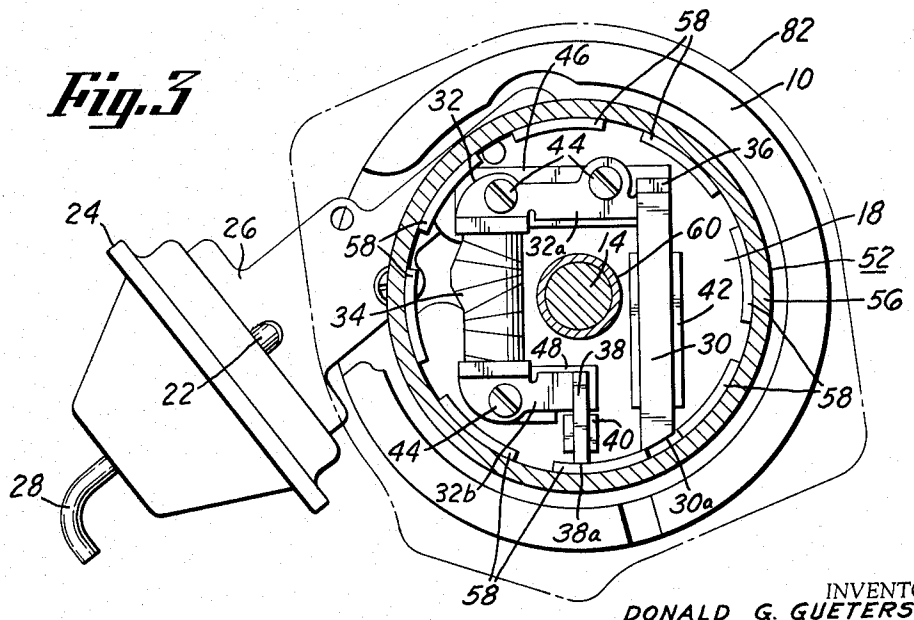


Fig. 3



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This invention relates to an ignition control unit and more particularly to an ignition control unit that is capable of generating pulses of voltage that can be used to control a semi-conductor ignition system.

One of the objects of this invention is to provide a magnetic pick-up type of distributor wherein the rotor of the distributor carries a device which is capable of making and breaking a magnetic circuit that includes a flux generating device such as a permanent magnet and a pick-up coil.

Still another object of this invention is to provide a magnetic pick-up type of distributor wherein the device for making and breaking a magnetic circuit is secured to a part of a centrifugal advance mechanism for the distributor.

Another object of this invention is to provide a magnetic pick-up type of distributor that includes a permanent magnet and a pick-up coil and a flux switching device which is driven by the shaft of the distributor and wherein the flux switching device is disposed around the assembly that includes the permanent magnet and the pick-up coil.

A further object of this invention is to provide a magnetic pick-up type of distributor that has a permanent magnet and pick-up coil mounted on an adjustable breaker plate and wherein the magnetic circuit between the permanent magnet and the pick-up coil is controlled by a rotatable cup that is formed of non-magnetic material and which carries a plurality of magnetic members and further wherein the cup-shaped member is driven by the centrifugal advance mechanism of the distributor.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein preferred embodiments of the present invention are clearly shown.

In the drawings:

FIGURE 1 is a sectional view of a magnetic pick-up type of distributor made in accordance with this invention and taken along line 1—1 of FIGURE 2.

FIGURE 2 is a sectional view taken along line 2—2 of FIGURE 1 with the distributor cap removed.

FIGURE 3 is a sectional view taken along line 3—3 of FIGURE 1 with the distributor cap removed.

Referring now to the drawings, and more particularly to FIGURE 1, the reference numeral 10 designates a metal base for the distributor of this invention. The base 10 has a bore 12 which receives a shaft 14 that drives the distributor. The shaft 14 is journaled for rotation in a sleeve bearing 16. The lower portion of the base 10 may have another sleeve bearing which is not illustrated for supporting the shaft 14 during its rotation. The shaft 14 is driven in any well-known manner by an engine which is controlled by the distributor of this invention.

The distributor of this invention is adapted to control a semiconductor ignition system which is not illustrated, but which can be of a type shown in the Short et al. patent, 3,087,001. Thus, the voltage pulses that are developed in the pick-up coil of the distributor can be used to control various types of semiconductors or transistor amplifiers in ignition systems.

The distributor of this invention has a timing or breaker plate designated by reference numeral 18. The plate 18 is secured to a depending sleeve 20 which is journaled for rotation on the outer surface of the sleeve bearing 16. The timing plate 18 can be adjusted by the actuating rod 22 of a conventional vacuum unit 24. The vacuum unit is secured to the base 10 by a bracket 26 and contains the usual shiftable spring biased diaphragm which is connected to shift the actuating rod 22. The interior of the vacuum unit is connected with a conduit 28 which is connected with the intake manifold of an engine when using the distributor of this invention. With the arrangement just described, the timing plate 18 can be rotated around the longitudinal axis of the shaft 14 in response to vacuum signals applied to the conduit 28.

The timing plate 18 as is best illustrated in FIGURE 3 carries a permanent magnet 30, a U-shaped member 32 formed of magnetic material and a coil winding 34. The U-shaped part 32 has an upstanding flange 36 which engages one end of the permanent magnet 30. This U-shaped part 32 has another upstanding flange 38 which is fitted within a spacer 40 that is glued or otherwise secured to the timing plate 18 and which is formed of non-magnetic material.

The coil winding 34 is wound on a section of the U-shaped part 32 which joins the sections 32*a* and 32*b*. The permanent magnet 30 is positioned within a spacer 42 which is formed of non-magnetic material and which is glued or otherwise secured to the timing plate 18. This permanent magnet 30 is glued to the spacer 42 and this permanent magnet may be of any well-known type. The end 30*a* of the permanent magnet is generally arcuately shaped as shown in FIGURE 3.

The U-shaped magnetic part 32 is secured to the timing plate 18 by a plurality of non-magnetic screws 44 which are threaded into the timing plate. The U-shaped part 32 is magnetically isolated from the timing plate 18 by spacers 46 and 48 which are formed of suitable non-magnetic material.

If desired the timing plate 18 and the non-magnetic spacers could be cast as one integral unit that would be formed entirely of non-magnetic material such as aluminum.

The distributor of this invention has a combined pole piece and weight base assembly which is generally designated by reference numeral 50. This assembly includes a cup-shaped member 52 which is formed of a non-magnetic material such as aluminum. The cup-shaped member 52 has a top wall 54 and a depending annular wall 56. Secured to the internal part of the depending annular wall 56 are a plurality of arcuately shaped magnetic parts 58 which may be formed of soft iron. These segments 58 are glued to the internal wall of the part 52 and are spaced circumferentially from each other in a manner best illustrated in FIGURE 3.

The top wall 54 of the non-magnetic part 52 has a splined bore which receives a bearing sleeve 60. The bearing sleeve 60 is secured to the top wall 54 of the non-magnetic part 52 and is also secured to a weight base designated by reference numeral 62. The bearing sleeve 60, the weight base 62 and the non-magnetic part 52 therefore form an assembly which is designated in its entirety by reference numeral 50. The bearing sleeve 60 receives the shaft 14 in a manner illustrated in FIGURE 1.

The top end of the shaft 14 is connected with a cam plate 64 illustrated in FIGURE 2. This cam plate 64 cooperates with a pair of flyweights 66 and 68. The flyweight 68 is pivoted on a pin 70 that is carried by the weight base 62. The flyweight 66 is pivoted on a pin 72 which is likewise carried by the weight base 62.

The cam plate 64 carries pins 74 and 76 and a spring 78 is interposed between the pins 70 and 74. A spring 80 is interposed between pins 72 and 76.

It will be appreciated that when the shaft 14 is driven, the flyweights 66 and 68 will be thrown outwardly and will adjust the weight plate 62 relative to the shaft 14. Since the weight plate 62 forms a part of the assembly 50,

the magnetic segments 58 will likewise be adjusted relative to the shaft 14 as a function of shaft speed.

The base 10 carries a conventional distributor cap designated in its entirety by reference numeral 82. This distributor cap has a plurality of conductive inserts 84 which are circumferentially spaced and which correspond in number to the number of cylinders of the engine on which the distributor is used. The electrode 84 is connected with the spark plugs of the engine as is well-known to those skilled in the art. The distributor cap 82 has a center electrode 86 which is connected to the secondary winding of the ignition coil when the distributor is in use.

The rotor of the distributor is designated by reference numeral 88 and is comprised of a body portion 90 formed as a one-piece plastic molding. This rotor member 90 carries contacts 92 and 94 which overlap and which are operative to connect the center electrode 86 with the circumferentially spaced electrodes 84 during rotation of the rotor 88. The rotor 88 is secured to the weight base 62 by means of screws 96.

It will be appreciated from the foregoing that the rotor 90 rotates with the weight base 62 and therefore rotates with the non-magnetic member 52, the magnetic inserts 58 and the sleeve bearing 60. It is seen from FIGURE 1 that the lower end of the bearing sleeve 60 abuts the upper end of the bearing sleeve 16.

In the operation of this device, the two terminal leads of the pick-up coil 34, which are not shown, are connected with an amplifier to control the current flow through the primary winding of an ignition coil. The inserts 84 of the distributor cap will connect with the spark plugs of an engine. The center electrode of insert 86 is connected with the secondary winding of an ignition coil.

It can be seen from an inspection of FIGURE 3 that a magnetic circuit will be completed between the end 30*a* of the permanent magnet 30 and the end 38*a* of the flanged part 38 whenever a magnetic segment 58 is in alignment with the ends of these two parts. When a segment 58 completes the magnetic circuit between the end 30*a* of the permanent magnet and the end 38*a* of the flanged part 38 flux can flow from one end of the permanent magnet, through the U-shaped magnetic core part 32, through a magnetic segment 58 and then back to the opposite end 30*a* of the permanent magnet 30. When magnetic flux passes through this magnetic circuit a pulse of voltage is induced in the pick-up coil 34. As the part 52 and the magnetic segments 58 continue to rotate, the time will come when a segment no longer completes the magnetic circuit between ends 30*a* and 38*a* and the flux therefore reduces. With this arrangement and with the part 52 in continuous rotation, pulse of voltage will be induced in the pick-up coil 34 which have a frequency that depends upon the speed of rotation of the shaft 14.

The pulses of voltage will be timed to provide a centrifugal advance by the provision of the weight plate 62, the cam plate 64 and the flyweights 66 and 68. Thus, as the speed of the shaft 14 increases, the part 52 is adjusted relative to the timing plate 18 to provide the required centrifugal advance.

The vacuum advance is provided by the vacuum unit 26 which can adjust the plate 18 relative to the rotating nonmagnetic part 52 that carries the magnetic segments 58.

While the embodiments of the present invention as herein disclosed, constitute preferred forms, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. An ignition control unit comprising, a shaft that is adapted to be driven by an engine, a centrifugal mechanism including a weight base and a cam plate, said cam plate being connected to said shaft, flyweight means mechanically coupled to said cam plate and weight base to adjust said weight base relative to said cam plate as a function of shaft speed, a fixed flux generating means, a fixed coil winding, magnetic means connecting said flux generating means and said coil winding in a magnetic circuit that terminates in at least two faces having a predetermined air gap, and magnetic control means secured to said weight base and positioned outside and encircling said flux generating means and outside and encircling said coil winding, said magnetic control means including means located in alignment with said faces to periodically magnetically connect said faces as said magnetic control means rotates with said weight base.

2. An ignition control unit comprising, a base member, a shaft journalled for rotation with respect to said base member, a distributor cap carried by said base member having a center electrode and a plurality of circumferentially spaced electrodes, a centrifugal mechanism including a weight base mechanically coupled to said shaft to be driven thereby, a rotor member secured to said weight base having contact means positioned to periodically connect said center electrode and said outer circumferentially spaced electrodes of said distributor cap, a voltage pulse generating means including a flux generating means connected in a magnetic circuit with a coil winding, said magnetic circuit terminating in at least two spaced pole faces, and control means positioned outside and encircling said flux generating means and coil winding secured to said weight base positioned adjacent said pole faces to periodically magnetically connect said pole faces as said weight base and control means rotate.

3. An ignition control unit comprising, a plate member, a permanent magnet carried by said plate member, a magnetic circuit terminating in at least two spaced pole faces, said magnetic circuit including a magnetic member magnetically connected with said permanent magnet, a coil winding magnetically coupled to said magnetic member, a centrifugal mechanism, a shaft mechanically coupled to said centrifugal mechanism for driving said centrifugal mechanism, said centrifugal mechanism including a weight base and flyweight means carried by said weight base that engage a cam plate that is connected to said shaft, and a nonmagnetic cup-shaped member fixed to said weight base, said cup-shaped member having a plurality of magnetic segments, said cup-shaped member being aligned with said pole faces of said magnetic circuit to periodically magnetically connect said pole faces as said cup-shaped member rotates.

4. A weight base and pole piece assembly for a voltage pulse generating type of distributor comprising, a nonmagnetic cup-shaped member having an end wall and a depending annular wall, a plurality of spaced magnetic segments carried by said annular wall of said cup-shaped member, a weight base, said weight base being secured to said end wall of said cup-shaped member, and flyweight means pivoted to said weight base, said flyweight means being adapted to cooperate with a cam plate for controlling the relative position of said cup-shaped member relative to a driving shaft that is adapted to be connected with said cam plate.

5. An ignition control unit comprising, a rotatable shaft, a plate member, a permanent magnet supported by said plate member, a magnetic member supported by said plate member connected in a magnetic circuit with said permanent magnet, a coil winding wound on said magnetic member, an air gap between an end of said permanent magnet and a portion of said magnetic member, a centrifugal mechanism including a cam plate secured to said shaft, a weight base, a plurality of flyweights carried by said weight base which are mechanically connected to said cam plate, a cup-shaped nonmagnetic member secured to said weight base, said cup-shaped member having a plurality of magnetic segments which are periodically positioned adjacent said air gap and which periodically close said air gap as said cup-shaped member rotates with said weight base.

6. An ignition control unit comprising, a rotatable shaft, a centrifugal mechanism mechanically connected to said

shaft including first and second plate members and a plurality of flyweights mechanically connecting said plate members, said centrifugal mechanism shifting said first plate member relative to said second plate member as a function of shaft speed, a nonmagnetic cup-shaped member connected to said first plate member, said cup-shaped member carrying a plurality of magnetic segments, a support, a permanent magnet carried by said support, and a magnetic member carrying a coil winding connected in a magnetic circuit with said permanent magnet, said magnetic member and coil winding being supported by said support, said magnetic circuit terminating in at least two spaced pole faces, said cup-shaped member encircling said magnetic member adjacent said pole faces, said magnetic segments being spaced from each other and located in such a position as to magnetically connect said pole faces periodically as said cup-shaped member rotates.

7. The ignition control unit according to claim **6** where the first plate member that drives the cup-shaped member also drives a rotor member that has contact means that control the connection of the electrodes of a distributor cap.

8. The ignition control unit according to claim **6** where the support is mechanically coupled to a vacuum unit to be adjusted thereby.

9. The ignition control unit according to claim **6** where the plate that carries said cup-shaped member is a weight base which has pivot means that pivotally support said flyweights.

10. An ignition control unit comprising, a shaft, a centrifugal advance mechanism including a cam plate, a weight base and a pair of flyweights, said cam plate being secured to said shaft to be driven thereby, said flyweights being pivoted to said weight base and engaging said cam plate to adjust said weight base relative to said shaft, a

nonmagnetic control member secured to said weight base, a plurality of circumferentially spaced magnetic segments carried by said control member, and a magnetic voltage pulse generating means including a permanent magnet and a coil winding, a magnetic circuit connecting said permanent magnet and coil winding which terminates in at least two spaced pole faces, said control member being positioned adjacent said pole faces whereby said magnetic segments periodically magnetically connect said pole faces as said control member rotates, said control member being positioned outside and encircling said permanent magnet and coil winding.

11. The ignition control unit as defined in claim **10** where the nonmagnetic member is generally cup-shaped and has a depending annular section which carries the magnetic segments.

12. The ignition control unit as defined by claim **10** where the weight base and nonmagnetic member are secured to a bearing sleeve which is journalled for rotation on said shaft.

13. The ignition control unit according to claim **10** where a rotor member that is formed of insulating material is driven by said weight base and where said rotor member carries a contact means that is adapted to cooperate with the electrodes of a distributor cap.

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