United States Patent [19]

Reddy

[11] **3,799,137**

[45] **Mar. 26, 1974**

[54] **PULSER ROTOR FOR IGNITION SYSTEMS**

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[22] Filed: **Jan. 24, 1972**

(Under Rule 47)

[21] Appl. No.: **220,065**

[52] **U.S. Cl.** ..... **123/149 R,** 123/149 D

[51] **Int. Cl.** **F02p 1/00**

[58] **Field of Search** ..... 123/148 E, 149 A, 149 R, 123/149 D

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[57] **ABSTRACT**

An ignition system of the fly wheel magneto type including a pulser rotor which develops an output in the associated coil sufficient to provide an energizing spark to the associated spark plug when a rotor is rotating in the desired direction of the rotor and minimal output when the rotor is rotating in the opposite direction to inhibit energization of the spark plug.

3 Claims, 4 Drawing Figures

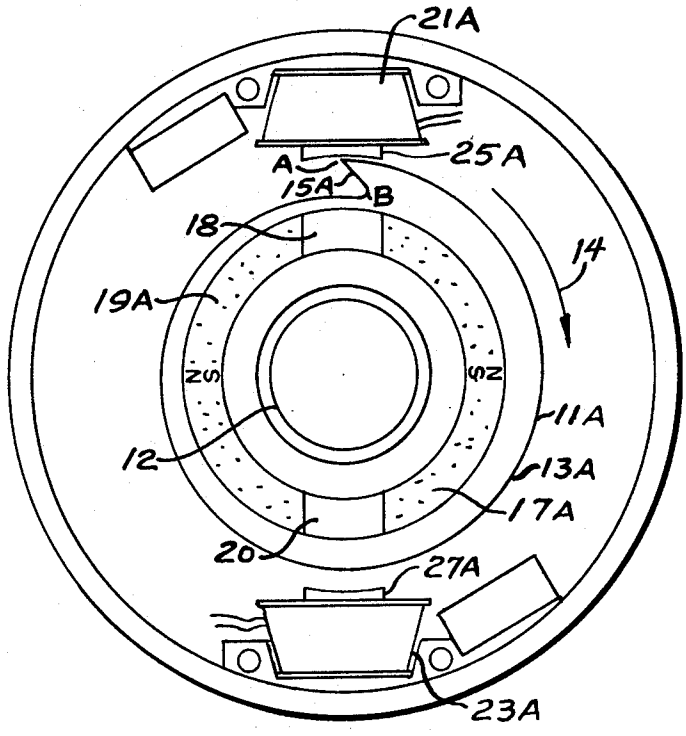


Fig. 1

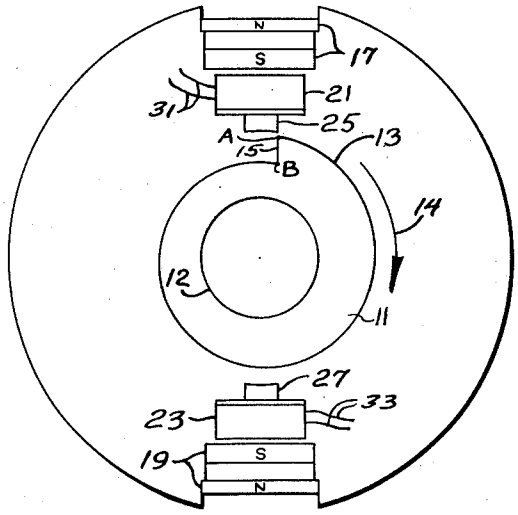


Fig. 2

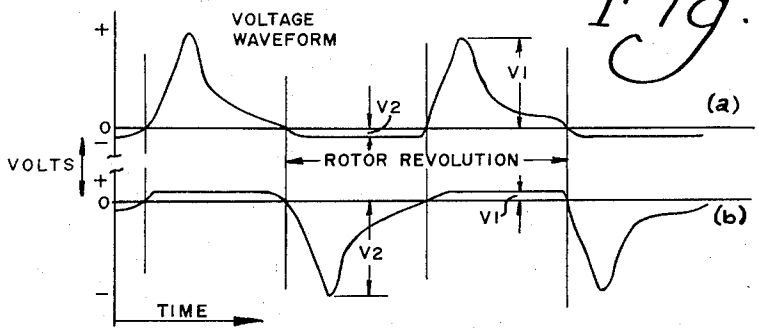
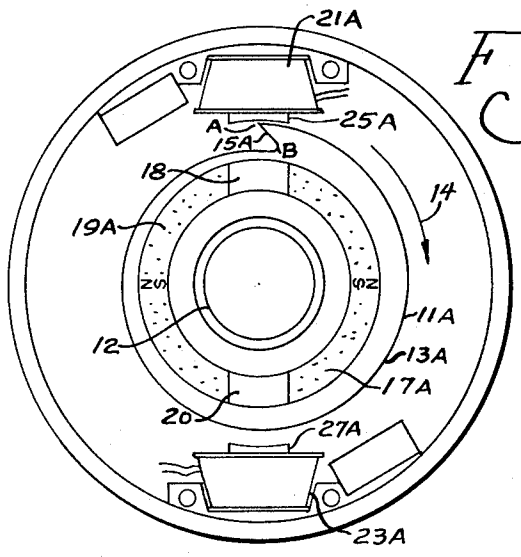


Fig. 3



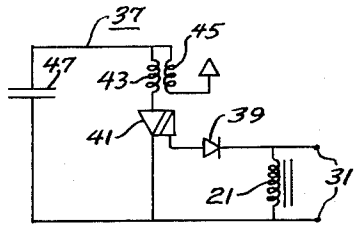


Fig. 4

PULSER ROTOR FOR IGNITION SYSTEMS

The present invention relates to a magneto flywheel ignition system and more specifically, to a magneto flywheel ignition system for a two cycle combustion engine wherein the ignition system includes ate least one pair of trigger coils for initiating spark ignition.

A problem in present two cycle combustion engines is that the engine may rotate in a forward direction and also in a reverse direction. Various efforts have been made to provide structure which will inhibit the engine from rotating in the reverse direction such as, for example, asymetrically magnetized flywheel magnetos. In other known units, electronic circuitry is employed to couple only pulses of the proper polarity to the associated coil to generate a pulse.

However, for one reason or another, such prior art devices are not entirely satisfactory and it is accordingly a principal object of the present invention to provide a pulser rotor for an ignition system which provides an output when the rotor is rotated in the desired direction of rotation, and provides a minimal pulse when the rotor is rotated in the opposite direction to thus inhibit the engine from rotating in a reverse direction.

The foregoing and other objects, features, and advantages of the invention will be apparent from the following more particular description as illustrated in the accompanying drawings wherein:

FIG. 1 is a plan view of a pulser rotor construction in accordance with the invention;

FIG. 2 shows some curves useful in explaining the operation of the inventive rotor;

FIG. 3 is a plan view of the second embodiment of the invention showing a pulser rotor with permanent magnets mounted thereon; and,

FIG. 4 shows a portion of an electronic circuit of the type used with the inventive pulser rotor.

Referring to FIG. 1, a pulser rotor 11 in accordance with the invention is mounted for rotation on a shaft 12 attached to a conventional flywheel, not shown. The pulser rotor 11 is formed of a magnetic material and comprises a unique construction wherein the outer surface or periphery 13 of the rotor is formed substantially as a convolution of a spiral.

In theory, the configuration of the periphery is mathematically determined. However, and as can be appreciated, for convenience in manufacturing, the periphery of the rotor does not follow the exact mathematical configuration of a spiral. The periphery 13 of the rotor 11 includes a peak or maximum diameter portion, point A, and a minimum diameter portion, point B; and points A and B are joined by a radially extending surface 15.

The inventive assembly includes two pairs of magnets 17 and 19 spaced in diametrical relation relative to the axis of the shaft 12 to provide respective magnetic fields through rotor 11. Trigger coils 21 and 23 are positioned radially inwardly from magnets 17 and 19 respectively, and each of the trigger coils 21 and 23 includes trigger pin or core 25 and 27, respectively, extending from the coil toward the center of the assembly. The inner surface of the pins 25 and 27 is positioned such that a predetermined air gap is present between the peak A of rotor 11 and the inner surface of the pins.

During the rotation of the rotor 11, the change in the magnetic flux through pins 25 and 27 is gradual. Emperical measurements show that the magnetic potential drop in the rotor 11, the associated brackets (not shown) and pins 25 and 27 is so small that these can be essentially neglected. Thus, all of the potential drop is assumed to occur in the air gap.

The output voltage on leads 31 and 33 is connected across coils 21 and 23 respectively is shown in FIG. 2A.

The rate of change of flux through pins 25 and 27 during the rotation of the spiral rotor 11 is gradual; and, as shown in FIG. 2, the voltage V2 is essentially constant and relatively small as compared to the voltage V1 generated when the peak A passes the trigger pins 25 or 27. This high voltage V1 will be coupled to suitable electronic circuitry 37 such as in FIG. 4 wherein the coil 21 is shown schematically coupled through a diode 39, a triac 41 and primary winding 43 of a transformer ignition coil 43 to capacitor 47. Secondary winding 45 is connected to an associated spark plug, not shown. When rotor 11 is rotating in the direction indicated by arrow 14, the coil 21 will be properly energized such that diode 39 is forward biased to turn on triac 31 and thereby discharge the associated capacitor 47 through primary winding 43 to energize secondary winding 45 and initiate a spark in an associated spark plug, not shown.

Similarly, a circuit essentially identical to that of FIG. 4, is connected through lead 33 to coil 23 to energize a second associated spark plug, also not shown.

If the direction of the rotation of rotor 11 is reversed, the polarity of voltage across the triggering coils 21 and 23 will be reversed as shown in FIG. 2*b*. In this latter situation, the positive voltage V1 developed across lead 31 will be relatively small in amplitude and will not energize the associated spark plug. The negative voltage V1 will be of a large amplitude, but it is blocked from turning ON the switching means of the associated electronic circuits such as shown in FIG. 4.

As a further explanation of the invention, note that when a discrete discontinuity, such as a projection, formed on a conventional rotor of a two cycle engine passes the coil pin 25, a waveform having negative and positive excursions or pulses of relatively equal amplitude will be generated. This will occur whether the motor is rotating in a first desired direction, or in a reverse direction. In the prior art, as in the present invention, a rectifier is normally placed in the associated electronic circuit to block out one or the other of the pulses.

In contrast to the prior art, in the present invention, if the rotor 11 is rotating in the desired, say, clockwise direction, the relatively large amplitude pulse V1 will be generated, see FIG. 2*a*; but, a negative pulse V2 of much smaller amplitude is generated. Pulse V2 is of insufficient amplitude to initiate the switching action to cause the associated spark plug to fire.

Conversely, if the rotor 11 of the invention is rotated in a reverse direction, a large negative pulse V2 and a much smaller amplitude positive pulse, V1, will be generated as indicated in FIG. 2*b*.

Thus, in a conventional rotor and with a rectifier placed in the associated electronic circuit, either the positive or negative pulse can be blocked out, but the other pulse may still cause the spark plug to be energized regardless of which direction the rotor rotates.

In the present invention, if the rotor rotates in the desired direction, the proper polarity pulse will be provided to cause the associated spark plug to be energized. If the rotor rotates in the reverse direction, a pulse of the opposite polarity will be generated, pulse V2, FIG. 2*b*, but this will be blocked out by the diode rectifier. The pulse V1 generated when the rotor **11** is rotating in the reverse direction is of insufficient amplitude to initiate the switching action to cause the associated spark plug to fire. Accordingly, the ignition system will not fire if the rotor **11** is rotated in the reverse direction.

FIG. **3** shows a second embodiment of the invention which operates in the same principal as the embodiment of FIG. **1.** The structure of FIG. **3** is a modification of the structure of FIG. **1.**

In FIG. **3** the rotor **11A** is also mounted on shaft **12** attached to the flywheel. A pair of diametrical spaced triggering coils **21A** and **23A** are provided. Suitable pins **25A** and **27A** are positioned in coils **21A** and **23A**. The essence of the difference in the construction of FIG. **3** and FIG. **1** is that in FIG. **1** the permanent magnets **17A** and **19A** are mounted in the rotor **11A**. The magnets **17A** and **19A** each comprise a foreshortened semi-circle with air spaces **18** and **20** formed between the ends of magnets **17A** and **19A**.

As in FIG. **3,** the periphery of the rotor **11A** has a maximum diameter point A and a minimum diameter point B joined by an inwardly extending surface **15A**. The surface **15A** is angled relatively more sharply than the surface of **15** of FIG. **1.**

As mentioned above, the operation of the structure of FIG. **3** is the same as in FIG. **1.**

As the rotor **11A** is rotated in the direction indicated by the arrow **14** , a waveform will be generated , as shown in FIG. 2*a* to provide the trigger pulses, and if the rotor **11A** rotates as a relatively reverse direction, the waveform will be as shown in FIG. 2*b* and hence, no trigger pulse will be provided.

While the invention has been particularly shown and

described with reference to preferred embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention.

I claim:

1. An ignition system comprising, in combination, a pulser rotor which is rotatable in a first desired direction and in a second or reverse direction, a trigger coil connected to provide a triggering pulse, a trigger pin associated with the said coil and mounted adjacent the periphery of said rotor to form an air gap therebetween, means for providing a magnetic path through said rotor, the air gap and said trigger pin, the periphery of said rotor being of a form wherein, as the rotor rotates, the width of the air gap gradually changes from maximum to minimum, and a discrete discontinuity is provided on said periphery to provide a given polarity pulse of relatively high amplitude when said rotor is rotating in the desired direction and a pulse of the same given polarity of much smaller amplitude when the rotor tends to rotate in a reverse direction.

2. An ignition system as in claim **1** wherein the periphery of the rotor is formed substantially as a convolution of a spiral along a 360° arc.

3. An ignition as in claim **1** wherein the periphery of said rotor forms a convolution of a spiral and has a discrete discontinuity where the maximum diameter of the spiral is joined to the minimum diameter of the spiral, and wherein rotation of the rotor in the desired direction develops a given polarity pulse of relatively large amplitude for use as a triggering pulse, rectifier means for blocking out pulses of other than said given polarity, and rotation of the rotor in the opposite direction develops a pulse of said given polarity which are of relative small amplitude whereby rotation of the rotor in the reverse direction will not develop a triggering pulse and hence, will inhibit operation of the rotor in the reverse direction.

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