Flywheel magneto ignition system pdf

llnited State Patent 1191 USA BREVETE Minks 123/148 MD Reddy Aug. 13, 1974 [54] FLYWHEEL MAGNETO AFTER SYSTEM 3,577,971 5/1971 Cavil .1 123/148 MD 3,669,086 6/1972 Beuk 123/148 MD 175] mentor: Narashmha Raddy B610, 3,715,650 2/1973 Draxler 123/148 MD [73] DivestmentZ Fairbanks Morse3 inc New York, 3,723,809 3/1973 Fusii 123/148 MD [22] Filed: 21 February, 1973 Primary Examiner-Laurence M. Goodridge Assistant Examiner-Rona1d B. Cox [21 1 Appl' 3341395 Lawyer, Agent, or FirmLeo .1. Aubel Related to the U.S. Application Data [63] Continuation Of Ser. No. 83,363, Oct. 23, 1970, abandmed 57 ABSTRACT g i 123/148 i A magneto flywheel ignition system of breakerless [58] Fieid l 48PMCD type using solid state devices to control the burning of Spark p g [56] References Quote 3 Claims, 8 Drawing Figures 1 FLYWHEEL MAGNETO APPLICATION SYSTEM This is a continuation, application Ser. No. 83,363, filed 23 October 1970 now abandoned. In many applications it is desirable to ensure a compact ignition. system of use with lightweight, portable motor devices, would be in boat engines. Such systems are preferably designed without battery to make the device lightand compact and to eliminate the need for a separate battery system. This invention refers to the above type ignition system and uses a simple magneto arrangement and a few simple circuit elements in its favorite incarnations. This invention preferably uses the flywheel as part of the magnet omagneto with permanent magnet generating means attached to the steering wheel. Thus, the flow-generating portion of the magneto is operated synchronously with the engine at all engine speeds and can be used to operate one or more components of the ignition system. Consequently, it is a main object of this invention to provide a flying magneto ignition system for the efficient supply of trigger pulses to energize an associated spark plug. Another object of the invention is to provide a low cost flying magneto ignition system for use on two cylinders, two-cycle combustion engines. It is an additional object of this invention to provide a breakerless ignition system using solid state devices to control the burning of associated spark plugs. The above features and other features and advantages of the invention will be evident from the following more special description, as illustrated in the accompanying drawings in which: FIG. 1 is a sketch of a steering wheel for mounting on a crankshaft of an engine in a conventional manner; FIGS. 2a, 2b, 2c and 2d are useful waveforms to explain the operation of the apparatus shown in the FIG. FIG. 3 is a schematic diagram of an ignition system circuit in accordance with the invention for the supply of a DC spark; FIG. 4 is a modification of the FIG circuit. 3 using trigger coil connected to the centre; and, FIG. 5 is another modification of the circuit fig. 3 for the supply of a needle spark. Referring to drawings, in FIG. 1 permanent permanent MI and M2 are fixed to a conventional flywheel 12 and are positioned diametrically opposite to each other. The steering wheel 12 normally rotates counterclockwise, as indicated by the arrow, and the south pole (S) of the M1 magnet is positioned to be the relatively leading pole; and the north pole (N) of the M2 magnet is positioned to be the main pole. An energy coil P having terminals A and B is wrapped either around the centre leg of an E 14 magnetic steel rolling assembly or a U-shaped rolling leg. The energy coil P and the trigger coil T and their associated assemblies 14 and 16 are positioned coplanarly in a fixed angular relationship between them and are stationary with respect to the flywheel 12, In the indicated embodiment, the Coils P and T are positioned in about 90 angular relationship. Electronic circuit 11 used with fig. 1 is shown in FIG. 3. In circuit 11, terminalpoints A and B of coil P are connected to a single phase full-wave rectifier bridge 15 to provide a DC. voltage charging capacitor 17 connected to conductive runways 20 and 22. Lead 20 is connected to the ground reference. Circuit 11 includes a pair of known silicon-controlled rectifiers 21 and 23 (hereinafter referred to as SCR). The first SCR 21 has an anode connected to a terminal of primary winding 25 of an S1 ignition coil that has the other terminal connected to lead 20. One terminal of secondary coil 27 of the Ignition Coil S1 is connected to lead 20 and the other terminal is connected to the associated spark plug, not shown. The SCR 21 cathode is connected to lead 22, and its gate electrode is connected to the cathode of a diode 31 and the capacitor plate 33. Diode anode 31 and the other capacitor plate 33 are connected to lead 22. Capacitor 33 filters high-frequency noise to prevent false triggering of SCR 21 and diode 31 functions to reduce inverse biases from gate to cathode of SCR 21. A capacitor 29 is connected along the anode to the SCR 21 cathode to function as a bypass capacitor to improve the voltage change rate compared to the characteristic SCR 21 time. The gate electrode of SCR 21 is also connected to the terminal of the trigger coil T. The other terminal b of the trigger coil T is connected to the gate electrode of the SCR 23. SCR 223 is connected in the same way in the circuit as SCR 21 and is connected in parallel with SCR 21. The SCR 21 anode is connected by the primary coil 35 of the ignition coil S2 to lead 20; and its cathode is connected to lead 22. The secondary coil 36 of the S2 ignition coil is connected to the associated spark plug. A diode 37 connected from gate SCR 23 to lead 22, and a capacitor 39 is connected in parallel with diode 37. Diode 37 and capacitor 39 operate in a similar way to diode 31 and 33. Condenser 41 is connected along the anode to the cathode of SCR 23 and works in a similar way to capacitor 29. The operation of the FIG. 1 and the FIG circuit. 3 will now be explained. Suppose there is a steady state when the M1 and M2 magnets are positioned in relation to the P energy coil and the T-trigger coil (shown in FIG. 1). SCR 21 and SCR 23 are OFF or non-conductive, and capacitor 17 has no charge. When the steering wheel 12 is determined to rotate counterclockwise, the M1 magnet passes through the energy coil P, and the movement of the magnet in relation to the coil produces a voltage with a waveform, as shown in the FIG. 2nd. The voltage is rectified through bridge 15. The 17 capacitor that is connected over bridge 15 is thus charged. Note that the upper plate of capacitor 17 is connected to lead 20 and the ground reference. As the flywheel 12 continues to rotate, the M2 magnet then passes the trigger of the T coil producing voltage with a waveform as shown in the FIG. 2b. Note that terminal a of the Trigger Coil T is connected to the SCR gate 21, and the other terminal b of the Trigger Coil T is connected to the SCR gate 23. The voltages developed at terminals a and b are of opposite polarity, hence the first inverse biases of the SCR 21 pulse and rotate on SCR 23. This ensures that SCR 2 1 is maintained in OFF state while SCR 23 is performing. With SCR 23 on, the load stored in capacitor 17 causes the current to flow through the primary coil 35 of the S2 ignition coil producing a voltage over the secondary coil 36. Winding output 36 is conventionally coupled to spark plugs associated with an engine cylinder. As it is known, the energy stored in capacitor 17 is discharged through the ignition coil S2 and SCR 23 to produce a spark over the spark plug electrodes and start the cylinder. The second pulse in the waveform of FIG. 2a turns to SCR 21 and at the same time reverses the prejudices of SCR 23. However, at this time and in the rotational position of the flywheel 12, the capacitor 17 has been completely discharged and no energy is available to be discharged by the primary winding 35 of the S1 ignition coil. Thus, no spark occurs in the spark plug connected to the S1 coil. The third pulse in the waveform of FIG. 2a is similar to the first pulse and produces the same gate bias conditions at SCR 23 and SCR 21 as the first pulse. However, because capacitor 17 is discharged, no power is available at this time to affect the spark plug connected to the ignition coil 52. After the M2 magnet has passed the T trigger coil, both SCR 21 and SCR 23 are reintroduced into an OFF state and there is no energy stored in capacitor 17. The counterclockwise subsequent rotation of the flywheel 12 causes the M2 magnet to pass the P energy coil producing voltage with a waveform, as shown in FIG. 20. As mentioned, the M2 magnet is essentially a duplicate of the M1 magnet, except that the north pole (N) of the M2 is the main pole; and, consequently, the waveform of FIG. 2b is of the same shape as in 2nd, but relatively inverted in polarity. The voltage produced in the energy coil P of magnet M2 is rectified through the bridge to charge capacitor 17. The subsequent rotation of the next flywheel 12 causes the M1 magnet to pass the T-trigger coil by producing a voltage with a waveform, this is what the FIG looks like. 2d. The first pulse in the waveform of FIG. 2d is converted to SCR 21 and reverse biases SCR 23. When SCR 21 starts, the load stored in capacitor 17 causes the current to flow through the primary coil 25 of the S1 ignition coil which produces a voltage at the outlet of the secondary winding 27 to cause a spark over the spark plug space associated with the S1 coil. The energy stored in capacitor 17 is thus dissipated, so, after discussed above, the second and third pulses in the waveform of FIG. 2d are essentially ineffective. Thus, on a rotation of the flywheel 12, the spark plugs associated with both the S1 and S2 coils are drawn, and each subsequent revolution of the flywheel repeats the sequence. The angular relationship of the T and P coils in the indicated embodiment is 90; however, this angular relationship can be varied. The angular relationship and rotational speed of the flywheel 12 should be such that the capacitor 17 is fully charged before any voltage is produced in the T-trigger coil by the magnet leading to the bias of an SCR to drive and discharge the capacitor 17. FIG. 4 is a schematic diagram of the circuit used with the trigger coil consisting of two windings labelled as T1 and T2. The FIG. 4 circuit is essentially similar to the FIG. 1 circuit, except that in FIG. 4 the Trigger coil T consists of two distinct T1 and T2 windings. The T1 and T2 windings have terminals a, b and c, a, terminals b and d respectively and are connected to each other and which drive 22. The T1 coil is wrapped in the opposite direction to the T2 coil. The FIG. 4 circuit essentially works the same as the fig. 3 circuit, but has the advantage of reducing the current flow through the SCR, thus promoting a lower operating temperature for these devices. The FIG circuit. 5 is a modification of the circuits fig. 3 and 4 to provide an alternating current or spark A.C. for the combustion of spark plugs. Note that, like the reference characters in FIGS. 3, 4, and 5, they refer to essentially identical components. In FIG. 5, a main change is the provision of triacs 61 and 63 instead of SCR 21 and 23 set out in FIG. 3 and 4. Triac 61 has main terminal 2 connected to coil 25 of the S1 coil and main terminal 1 connected to lead 22. The gate electrode 3 of the 61 thrall is connected by a diode 66 and resistor to the terminal of the T1 coil. The other terminal b of the T1 coil is connected to lead 22. A resistor 67 connects triac 61 to lead 22, and a capacitor 69 is connected in parallel with resistor 67. Similarly, terminal 2 of triac 63 is to coil 35 coil S2. The gate electrode g of the 63rd is connected by a diode 73 and resistor 71 to terminal c of the T2 coil. Terminal d of the T2 coil is to drive 22. A resistor 77 connects triac 63 to lead 22, and a capacitor is connected in parallel with resistor 77. As is known, triacs 61 and 63 are capable of performing in both directions, thus allowing the current to flow through those coils 25 and 35 in both directions to provide alternating current pulses. Alternative pulses supplied to spark plugs have been found to be effective in keeping the sockets clean. In operation, the rectified output on Deck 15 is connected by a resistor 26 and capacitor 17. The potential at junction 24 of resistor 26 and capacitor 17 varies around a zero reference potential. Resistor 26 thus allows capacitor 17 to be charged in both a positive and negative direction in order to provide adequate polarity energy to flow through the 61st and 63th triggers to supply the alternative current mentioned above. The T1 and T2 trigger coils are reached in the centre with their shared terminals b and d and drive 22. Diodes 66 and 73 eliminate any reverse voltage that is effective at gate g of triacs 61 and 63. For example, diode 66 blocks the flow path of the current in the direction of terminal b of the Tl coil through lead 22, resistor 67, capacitor 69, resistor 65 and back to terminal a of the T1 coil. Since there is no current, the resistor 67 will be prevented from having a voltage that is negative to its terminal, which is connected to the g gate of triac 61 and positive to its terminal, which is connected to lead 22. Consequently, triac 61 is prevented from activating when a negative pulse develops on the terminals a to b of the T1 coil. Diode 73 works in a similar way to prevent the start of triac 63 when a negative pulse develops in the 0 to d terminals of the T2 coil. The T1 and T2 trigger coils and diodes 66 and 73 together allow a triac to be maintained in off or non-conductive state while the other triac is in ON state. , all within the scope of the invention, as claimed in the following claims. Support: 1. An ignition system for a flying motor and using at least two spark plugs comprising in combination: a pair of magnets mounted in that angular relationship on the steering wheel for its rotation; the magnets in question being positioned in such a way that the north pole of a magnet is the relatively leading pole, so they say the steering wheel is rotated and the other magnet being positioned so that its south pole is the relatively leading pole, so it is said the steering wheel is rotated; the first and second magnetic assemblies each having at least one winding, the said assemblies being relatively stationary and in a distant angular relationship with the other, said magnets that rotate in a path adjacent to the mentioned magnetic assemblies, whereby the rotation of those magnets in the past, said that magnetic assemblies develop an alternating current energy in windings, rectifier means the connection to a first winding in the said assembly for the correction of the said current energy, capacitive means connected to these means of energy storage developed in the first winding mentioned, switching means connected to a winding in the second assembly mentioned, said that it is activated by the energy developed in the second assembly mentioned to initiate the discharge of the said capacitive means to provide an energy boost for those plugs. , that switch means that it comprises a pair of triac means, each triac means that it has two main terminal electrodes and a gate electrode, i.e. the transformer means associated with a spark plug in question connected to one of the electrodes of the main terminal mentioned in each triac means, said the winding in the second assembly being operated in the centre, and that diode means the connection of each gate electrode to the opposite terminals of the said winding in the second assembly mentioned , by which, when the current flows in the mentioned triac means that an energy boost is supplied to the associated spark plug, a first part said the second liquidation said the second connection to the mentioned triac means to allow an energy boost in the coil to start only a single triac means and bias other means triac OFF in a certain period to allow said triac means to provide alternating current pulses to the mentioned spark plugs. 2. An ignition system as in application 1 in which the central coil is connected to provide one-way pulses only to the gating electrode of the triaculus. 3. An ignition system as in application 1 in which the means of the diode are connected in order to have their respective anods connected to the winding in the second assembly and their cathodes connected to the junction between that gate and resistive means to prevent the triacles concerned from starting by a negative impulse produced in that winding. Winding.