Jan. 27, 1953 R. E. PHELON 2,627,041

FLYWHEEL MAGNETO HAVING SHORT CIRCUITING MEANS

Filed April 25, 1951

FIG. 1

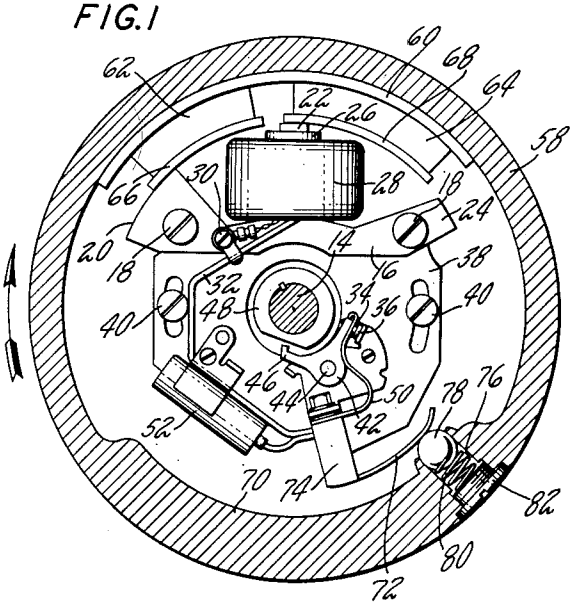


FIG. 3

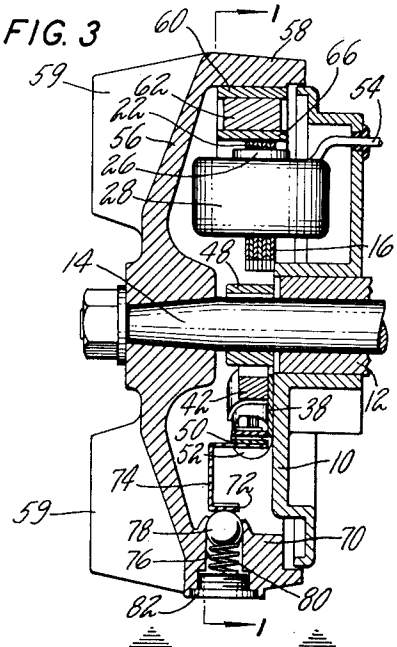


FIG. 2

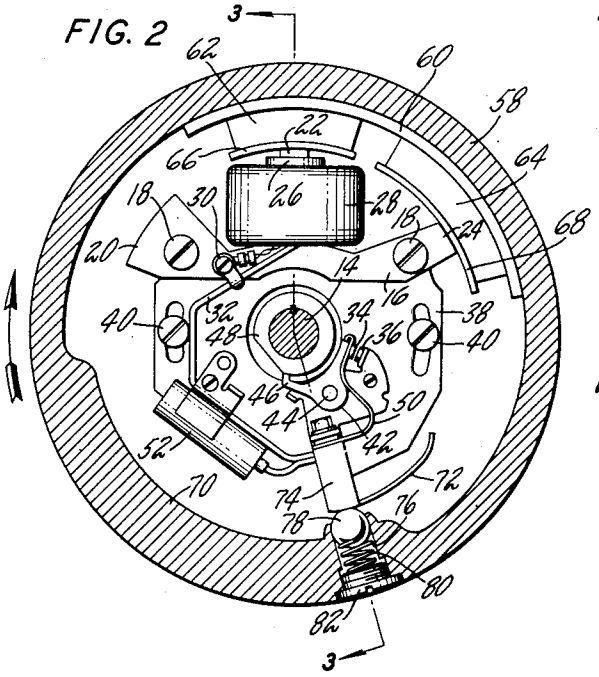


FIG. 4

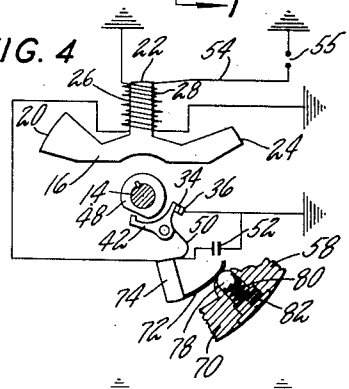
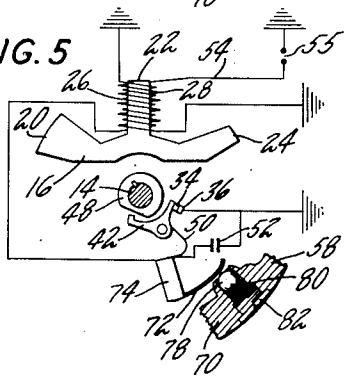


FIG. 5



INVENTOR
RUSSELL E. PHELON
BY S. Jay Teller
ATTORNEY

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FLYWHEEL MAGNETO HAVING SHORT CIRCUITING MEANS

Russell E. Phelon, Longmeadow, Mass.

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4 Claims. (Cl. 310—74)

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The invention relates to a high tension magneto of the flywheel type and particularly to such a magneto adapted for use with an internal combustion engine. A magneto embodying the invention has a stationary core structure and a rotatable field structure which rotates around the core structure.

In a magneto of the type mentioned, there is danger of a kick back in hand cranking if a spark occurs at too low a speed. The principal object of the present invention is to provide a magneto having automatically operable means which serves to prevent the formation of a spark at low speeds and which permits normal functioning when the speed equals or exceeds a predetermined critical speed.

Another object of the invention is to provide various features of construction and arrangement whereby the foregoing more general object is attained.

In the drawing I have shown in detail a preferred embodiment of the invention, but it will be understood that various changes may be made from the construction shown, and that the drawing is not to be construed as defining or limiting the scope of the invention, the claims forming a part of this specification being relied upon for that purpose.

Of the drawing:

Fig. 1 is a vertical transverse sectional view of a magneto embodying the invention, the section being taken along the line 1—1 of Fig. 3.

Fig. 2 is a view similar to Fig. 1 but showing the rotatable field structure in a different position.

Fig. 3 is a vertical longitudinal sectional view taken along the line 3—3 of Fig. 2.

Fig. 4 is a fragmentary schematic view showing electrical connections.

Fig. 5 is a view similar to Fig. 4 but showing one of the parts in a different position.

The magneto as shown in the drawing is generally similar to that shown in the Phelon Patent No. 2,472,313, but the rotor thereof is similar to that shown in the Phelon Patent No. 2,538,534.

The core structure of the magneto is nonrotatable and as shown in the drawing, it is carried by a frame 10 provided with a bushing 12 which provides a bearing for a rotatable shaft 14. The shaft 14 may be an extension of the crankshaft of the engine with which the magneto is to be used, and in any event it is rotated in timed relationship with the engine. The core structure comprises a magnetic core 16 preferably laminated and constructed and arranged to provide

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a plurality of circularly spaced poles having arcuate faces which are concentric with the axis of the shaft 14 and equidistant therefrom. Preferably, the poles of the core are all within an arc of approximately 180° or less and are at one side of a diametral plane through the axis of the shaft. The core is connected with the frame 10 by screws 18, 18. Primary and secondary generating windings or coils surround one of the poles of the core 16. As shown the core 16 has three poles 20, 22 and 24, and primary and secondary coils 26 and 28 surround the intermediate pole 22. The primary coil has a relatively small number of turns, as for instance 175, and the secondary coil has a relatively large number of turns, as for instance 10,000.

The primary coil 26 is suitably grounded, for instance by being connected to the core at 30. The ungrounded end of the primary coil is connected by means of an insulated conductor 32 with a circuit making and breaking means which includes breaker points 34 and 36. The circuit making and breaking means is supported in part by a plate 38 which is connected by screws 40, 40 with the frame 10. The screws 40, 40 extend through arcuate slots in the plate 38, and the plate is angularly adjustable about the axis of the shaft 14.

The breaker point 36 is connected with the plate 38 and is thus grounded. The breaker point 34 is carried by a rocker arm 42 pivoted at 44 to the plate 38. The rocker arm 42 has an extension 46 which is engaged by a cam 48 mounted on the shaft 14. A spring 50 serves to bias the arm 42 to move the point 34 into engagement with the point 36, and this spring, or an auixliary conductor associated therewith, serves to provide an electrical connection between the conductor 32 and the said breaker point 34. When the shaft 14 is rotated the cam 48 oscillates the rocker arm 42 to move the point 34 and to thus make and break the electrical connection between the points 34 and 36 during each rotation of the rotor. A condenser 52 is connected in parallel with the breaker points 34 and 36 in accordance with customary practice. The condenser is preferably carried by the plate 38.

The secondary coil 28 is suitably grounded, for instance by being connected with the core 16 at 30. The secondary coil is provided at its ungrounded end with an insulated conductor 54 by means of which it is connectible with the spark plug 55 of the engine, as indicated in Figs. 4 and 5.

The rotor of the magneto includes a flywheel

56 which is connected with the shaft 14 so as to be rotatable therewith. The flywheel is preferably formed of magnetic material, but it may less advantageously be formed of nonmagnetic material. The flywheel is grounded by reason of its connection with the shaft 14. The flywheel 56 is shown as having a disc-like outer wall carrying an annular flange 58 which surrounds the before-described core structure. The inner or internal face of the annular flange 58 is preferably cylindrical at least in part. The flywheel as illustrated has integral blades 59 adapted to cooperate with a housing, not shown, to provide a circulation of air.

The rotor of the magneto also includes a field structure which may be similar to that shown in the said Patent No. 2,538,534. In general the said field structure comprises a magnet unit which includes an arcuate connecting member 60 formed of magnetic metal and secured to the inner face of the flywheel flange 58. Secured to the member 60 are two similar permanent magnets 62 and 64 which are radially charged in opposite directions. Secured respectively to the inner faces of the magnets 62 and 64 are arcuate pole pieces 66 and 68 formed of magnetic metal. The arcuate inner faces of the pole pieces 66 and 68 are positioned to move in close proximity to the faces of the poles 20, 22 and 24 of the core 16.

The flywheel 56 is formed to provide a counterbalance for the magnet unit that has been described. As shown, the flange 58 has a thicker portion 70 which is opposite the said magnet unit and which provides the required counterbalance.

When the rotor including the flywheel and the field structure or magnet unit rotates in the clockwise direction, the leading pole piece 68 registers with the intermediate pole 22 of the core 16 and at the same time the trailing pole piece 66 registers with the left pole 20 of the core 16 as shown in Fig. 1, thus establishing a magnetic circuit through the intermediate pole 22 in one direction. When the rotor reaches a position just before that shown in Fig. 2, the leading pole piece 68 leaves the intermediate pole 22 and comes into register with the right pole 24 of the core 16. In the same position the trailing pole piece 66 leaves the left pole 20 and comes into register with the intermediate pole 22. The direction of the magnetic circuit through the center pole 22 is suddenly reversed and a maximum value of voltage is generated in the primary coil 26. The cam 48 is so positioned as to separate the breaker points 34 and 36 at least approximately the instant of maximum voltage in the primary coil, thus generating a high voltage in the secondary coil 28 which is connected with the spark plug 55 of the engine. The timing of the spark can be changed within narrow limits by angularly adjusting the plate 38 and the parts carried thereby.

In accordance with the present invention a means is provided for short circuiting the said circuit making and breaking means during the successive operations thereof. The short circuiting means is initially operative while the rotor is rotated at a relatively low speed and the said short circuiting means includes a centrifugally movable element carried by the flywheel and constructed and arranged to move relatively thereto so as to cause the short circuiting means to be inoperative when the speed of rotor rotation equals or exceeds a predetermined critical speed.

Preferably and as shown, an arcuate electrical contact 72 is provided, the major portion of the outer face of which is substantially concentric with the axis of rotor rotation. The contact 72 is positioned within the annular flange of the flywheel and it is carried by a conducting arm 74 which is electrically connected with the spring 50. The flange 58 of the flywheel and preferably the thicker portion 70 thereof is provided with a radial opening 76 in which is located a radially movable electrical contact which is preferably a metallic ball 78. The opening 76 is so formed that the ball contact cannot move inwardly to any substantial extent beyond the relative position shown in Figs. 1, 2, 3 and 4. In the said position the ball contact 78 is engageable with the arcuate contact 72. A coil compression spring 80 is located in the opening 76, this spring abutting at its inner end against the ball contact 78. A screw 82 is threaded into the outer portion of the opening 76 and the outer end of the spring 80 abuts against the said screw. Thus the spring serves to bias the ball contact toward its innermost position.

During each rotation of the rotor at low speed, the ball contact 78 engages the contact 72 as shown in Fig. 1 and remains in engagement with the contact until the position shown in Fig. 2 is reached. It will be seen that during the movement of the rotor from the Fig. 1 position to the Fig. 2 position the breaker point 34 has been separated from the breaker point 36. The separation of the breaker points normally serves to break the circuit in the primary coil and to produce a spark forming voltage in the secondary coil. However, with the ball contact 78 in engagement with the contact 72 a short circuit is provided across the breaker points, the said short circuit including the contact 72, the ball contact 78 and the grounded flywheel 56. By reason of the short circuit, the circuit in the primary coil is not broken and no spark is formed.

When the speed of rotation of the rotor equals or exceeds a predetermined critical speed, which may be approximately 500 R. P. M., the ball contact 78 moves outwardly by centrifugal action to the relative position shown in Fig. 5, the pressure exerted by the spring 80 being overcome and the said spring being compressed. When the ball contact 78 has moved outwardly by centrifugal action as described, it is no longer in position to engage the contact 72 and the short circuiting means becomes inoperative. With the short circuiting means inoperative the circuit is broken in the normal manner at the breaker points 34 and 36.

The invention claimed is:

1. A flywheel magneto comprising in combination, a rotor including a flywheel and also including a field structure carried by the flywheel, a stator including a core having a plurality of circularly spaced pole faces in cooperative relationship with the field structure of the rotor and also including a primary coil and a secondary coil on the core, the said secondary coil being connectible with a sparking device, means operable during each rotation of the rotor for making and breaking a circuit through the said primary coil and normally serving upon the breaking of the said circuit to produce a spark forming voltage in the secondary coil, and a means operative at rotor speeds below a predetermined critical speed for short circuiting the said circuit making and breaking means, the said short circuiting means including a centrifugally movable element carried by the flywheel and constructed and arranged to move relatively thereto when the speed of rotor rotation equals or exceeds the said

critical speed so as to cause the short circuiting means to be then inoperative.

2. A flywheel magneto comprising in combination, a rotor including a flywheel and also including a field structure carried by the flywheel, a stator including a core having a plurality of pole faces in cooperative relationship with the field structure of the rotor and also including a primary coil and a secondary coil on the core, the said secondary coil being connectible with a sparking device, means operable during each rotation of the rotor and including relatively movable breaker points for making and breaking a circuit through the said primary coil and normally serving upon the breaking of the said circuit to produce a spark forming voltage in the primary coil, a stationary contact electrically connected with one of the breaker points, and a contact carried by the flywheel and movable relatively thereto to an operative position wherein it is engageable with the said stationary contact during each rotor rotation to short circuit the said breaker points and to an inoperative position wherein it is not engageable with the said stationary contact, the said relatively movable contact being spring biased to its said operative position and being movable by centrifugal action to its said inoperative position when the speed of rotor rotation equals or exceeds a predetermined critical speed.

3. A flywheel magneto comprising in combination, a rotor including a flywheel and also including a field structure carried by the flywheel, a stator including a core having a plurality of pole faces in cooperative relationship with the field structure of the rotor and also including a primary coil and a secondary coil on the core, the said secondary coil being connectible with a sparking device, means operable during each rotation of the rotor and including relatively movable breaker points for making and breaking a circuit through the said primary coil and normally serving upon the breaking of the said circuit to produce a spark forming voltage in the primary coil, an arcuate stationary contact electrically connected with one of the breaker points and having an outer face substantially concentric with the axis of rotor rotation, and a contact carried by the flywheel and radially movable relatively thereto to an inner operative position wherein it is engageable with the outer face of the said arcuate stationary contact during each rotor rotation to short circuit the said breaker

points and to an outer inoperative position wherein it is not engageable with the said arcuate stationary contact, the said radially movable contact being spring biased to its said inner operative position and being movable centrifugally in opposition to the spring bias to its said outer inoperative position when the speed of rotor rotation equals or exceeds a predetermined critical speed.

4. A flywheel magneto comprising in combination, a rotor including a flywheel having an annular flange with a radial hole therein and also including a field structure carried by the said flange of the flywheel, a stator including a core having a plurality of pole faces in cooperative relationship with the field structure of the rotor and also including a primary coil and a secondary coil on the core, the said secondary coil being connectible with a sparking device, means operable during each rotation of the rotor and including relatively movable breaker points for making and breaking a circuit through the said primary coil and normally serving upon the breaking of the said circuit to produce a spark forming voltage in the primary coil, an arcuate stationary contact positioned within the flange of the flywheel and electrically connected with one of the breaker points and having an outer face substantially concentric with the axis of rotor rotation, a ball contact positioned at least in part within the radial hole in the flywheel flange and radially movable in the said hole, and a spring in the said radial hole engaging the said ball contact to bias it to an inner operative position wherein it is engageable with the outer face of the said arcuate stationary contact during each rotor rotation to short circuit the said breaker points, the pressure applied by the spring to the ball contact being such that the latter is centrifugally movable outwardly to an inoperative position wherein it is not engageable with the said arcuate stationary contact when the speed of rotor rotation equals or exceeds a predetermined critical speed.

RUSSELL E. PHELON.

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The following references are of record in the file of this patent:

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