Jan. 9, 1968 W. R. JOHNSON 3,362,389

IGNITION SYSTEM

Filed Dec. 1, 1965

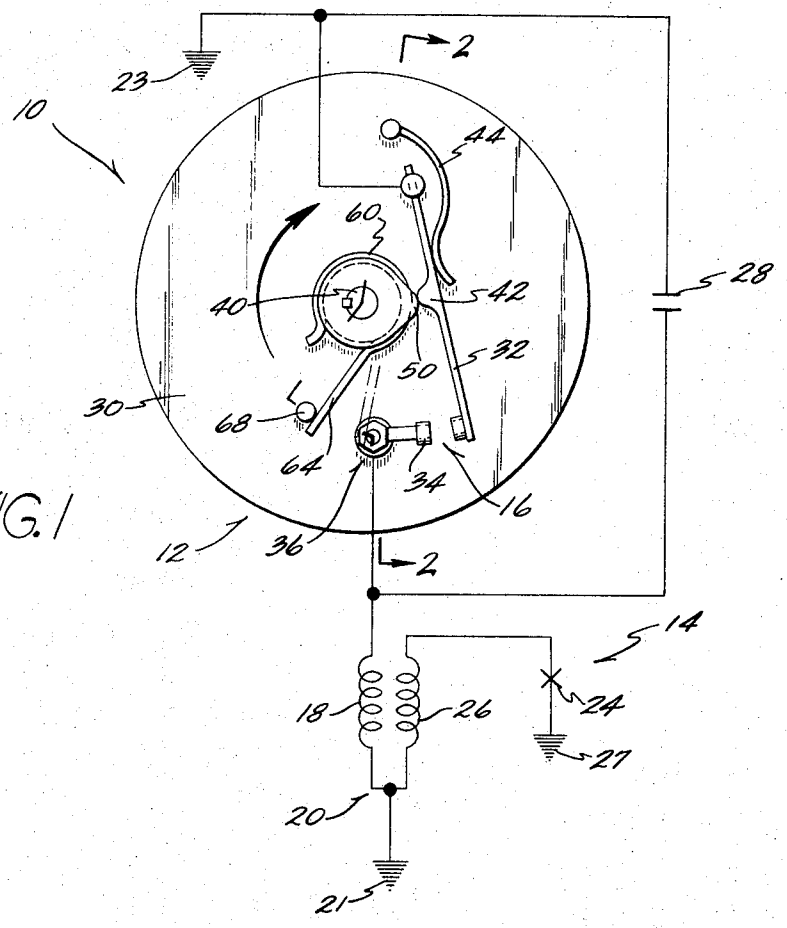
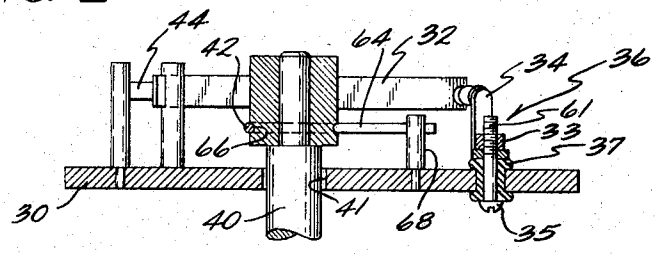


FIG. 1

FIG. 2



INVENTOR
WALLACE R. JOHNSON

By
Wheeler, Wheeler & Wheeler
ATTORNEYS

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IGNITION SYSTEM

Wallace R. Johnson, Mundelein, Ill., assignor to Outboard Marine Corporation, Waukegan, Ill., a corporation of Delaware

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ABSTRACT OF THE DISCLOSURE

Disclosed herein is an ignition system including an arrangement for grounding the primary coil in the event of reverse rotation so as to prevent reverse rotation operation.

This invention relates to ignition systems and to methods of operating ignition systems and, more particularly, to ignition systems for internal combustion engines.

An object of the invention is to provide an ignition system which prevents operation of an internal combustion engine in a direction opposite to its normal direction of rotation.

Another object is to provide a method of operating an ignition system whereby the engine is prevented from firing upon rotation of the engine in a predetermined direction.

In accordance with the invention, the ignition system includes a primary circuit comprising a pair of breaker points disposed in series with the primary winding of a magneto coil or of a battery powered ignition coil. Means are provided for grounding the primary circuit upon reverse rotation of the internal combustion engine to prevent firing of the engine.

Other objects, advantages and features will become apparent in the following description and accompanying drawings in which:

FIGURE 1 is a partially schematic, plan view of an ignition system incorporating various of the features of the invention; and

FIGURE 2 is a sectional view taken along line 2—2 of FIGURE 1.

Referring now to FIGURE 1, the ignition system of the invention is broadly identified by the numeral **10**, and generally comprises a primary circuit **12** and a secondary circuit **14**. The primary circuit includes a pair of breaker points **16** connected in series with a source of current such as the primary coil or winding **18** of a magneto **20**. This invention contemplates the use of a conventional ignition coil and battery and/or generator arrangement as a source of current in place of the magneto. The primary circuit is grounded at **21** and **23**. To reduce arcing and insure instantaneous interruption of the current in the primary circuit, a capacitor **28** is connected across the points **16**.

The secondary circuit **14** includes a spark plug **24** connected in series with the secondary coil or winding **26** of the magneto **20**. As shown in the drawings, the secondary winding **26** of the magneto **20** is also connected to the ground **27** and the secondary circuit **14** is completed through the ground **21**.

The breaker points **16** are carried on a mounting plate **30** in adjacent engaging relationship to each other and comprise a pivotally movable arm or member **32** which is grounded, such as to the mounting plate **30**, and a stationary member **34** which is suitably mounted on the mounting plate **30** by a nut **33** and screw **35**, referred to as a mounting terminal **36**. The stationary member **34** is insulated from the mounting plate **30**, but not from the screw **35** and nut **33**, by the rubber washer **37** (FIGURE 2) or other suitable insulator means. The primary coil **18**

is electrically connected to the mounting terminal **36** so that the terminal **36** is located between the primary coil **18** and the breaker points **16**. If desired, the stationary member **34** can be displaced from the mounting terminal and electrically connected thereto through a suitable wire (not shown).

The movable arm **32** is located proximate an ignition cam shaft **40** extending through a bore **41** in the mounting plate **30** and includes thereon a cam follower member **42** of non-conducting material. The arm **32** is biased toward the shaft **40** by a suitable spring **44** to hold the cam follower **42** in engagement with the ignition cam shaft **40**. Though this invention is applicable to a multi-cylinder engine, the illustrated embodiment shows the ignition system **10** adapted for use with a single cylinder engine; therefore, the ignition cam shaft **40** has a single cam lobe **50**.

The ignition system, thus far described, operates in a conventional manner. Current supplied by the magneto **20** travels through the primary circuit **12**. When the cam lobe **50** contacts the follower **42**, the breaker points **16** separate to cause a sudden interruption of the current flow in the primary circuit **12** including the primary coil **18**, thereby inducing a high-voltage in the secondary coil **26**, which voltage is sufficiently high to cause firing of the spark plug **24**. The capacitor **28** absorbs any current which would tend to cause arcing across the breaker points **16**.

Because ignition systems on multi-cylinder two-cycle engines (particularly battery ignition systems) can produce equally effective spark plug voltages if the engine is operated in an undesired reverse rotation, means operable in response to rotation of the engine in reverse direction are provided to prevent reverse engine operation by preventing the points from interrupting current flow through the primary circuit **12** and ultimately to prevent the engine from firing.

The aforementioned means is effective to insure continued current flow in the primary circuit **12**, when the engine is rotated in the reverse direction, by grounding the primary circuit at a point between the source of current and the breaker points **16**. When the primary circuit is thus grounded, the opening and closing of the points **16** cannot interrupt current flow in the primary circuit **12**, thereby preventing a high-voltage from being induced in the secondary coil **26** of the magneto **20** and ultimately preventing the engine from starting.

In the preferred embodiment, the aforementioned means generally comprises a grounding spring **60** carried on the ignition cam shaft **40**. In the illustrated embodiment, the spring **60** operates in response to reverse rotation of the ignition cam shaft **40** to ground the primary circuit at a point between the primary coil **18** and the breaker points **16**. The spring **60** is disposed to contact the extended end **61** of the mounting terminal screw **35** upon reverse rotation of the engine to thereby ground the insulated point **34** and provide an alternate path for the current flow in primary circuit **12** in lieu of a current flow path through the breaker points **16**.

More particularly, the spring **60** has a circular portion **62** which snaps into a groove **66** in the ignition cam shaft **40**. The spring **60** is resilient, and the circular portion **62** is of slightly less diameter than that of the groove **66** so that the spring **60** tightly grips the ignition cam shaft **40** to provide a ground connection for the spring **60**. The spring **60** has an arm or extension **64** which is disposed to move between the insulated contact point **34** and a stop pin **68** extending from the mounting plate **30**.

In the illustrated embodiment, normal rotation of the engine affords rotation of the ignition cam shaft **40** in a clockwise direction (as shown by the arrow in FIGURE 1). Under such normal operating conditions, the arm **64**

of the spring **60** engages the spring stop **68** (as shown in broken lines in FIGURE 1) with no effect on current flow in the primary circuit **12**. The pressure of the grounding spring **60** against the stop pin **68** tends to loosen the fit of the spring **60** in the ignition cam groove **66**, thus reducing running friction therebetween and allowing easy relative rotation between the ignition cam **40** and the grounding spring **60**.

If the engine should attempt to operate in a reverse rotation condition (in a counter-clockwise direction as seen in FIGURE 1), the arm **64** of the grounding spring **60** engages the mounting terminal screw **35** (as shown in phantom lines in FIGURE 1) thereby grounding the ignition primary circuit **12** and thereby preventing firing of the spark plug **24**. Under such reverse rotation conditions, the pressure of the grounding spring **60** against the mounting terminal screw **35** tends to tighten the fit of the spring **60** in the ignition cam groove **66**, thereby insuring a good ground contact.

Various of the features of the invention are set forth in the following claim.

What is claimed is:

1. An ignition system for an internal combustion engine, said system comprising a mounting plate grounded to the engine, a shaft driven by the engine and including thereon an ignition cam, a mounting terminal electrically insulated from said mounting plate, a pair of breaker points carried

on said mounting plate and disposed to be opened and closed by said ignition cam, one of said points being electrically connected to said mounting terminal, the other of said points being electrically connected to said mounting plate, a magneto having a primary winding with a ground to said engine, said primary winding being electrically connected to said mounting terminal, a stop pin mounted on said mounting plate, and a spring carried on said ignition cam shaft and having an arm disposed to contact said stop pin upon rotation of said engine in a normal operating direction and to contact a portion of said mounting terminal upon rotation of said engine in a reverse direction to afford grounding of said ignition system and thereby prevent engine firing, said spring including a partially circular portion which resiliently grips said ignition cam shaft, said grip of said spring loosening upon contact of said arm with said stop pin and said grip of said spring tightening upon contact of said arm with said mounting terminal.

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LAURENCE M. GOODRIDGE, *Primary Examiner.*