IGNITION SYSTEM FOR AIR COOLED INTERNAL COMBUSTION ENGINE

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This invention relates to internal combustion engines and particularly to the component parts of the ignition system; Figure 3 is a sectional view through the flywheel end of the crankshaft illustrating the magneto assembly of the engine, the major portion of the cover thereof being broken away;

Figure 4 is a detail sectional view through Figure 3 on the plane of the line 4—4, but to better illustrate the manner in which the breaker mechanism of the magneto is operated, this view shows the crankshaft turned 90 degrees from the position in which it is shown in Figure 3; Figure 5 is a perspective view of the breaker arm and the mounting therefor illustrating the parts disassembled; and Figure 6 is a perspective view of the heat shield located between the ignition coil and the adjacent side of the cylinder.

Referring to the accompanying drawings in which like numerals indicate like parts throughout the several views, the numeral 5 designates generally the crankcase-cylinder casting of the engine consisting of a crankcase portion 6 and a cylinder 7. This main casting together with a cylinder head 8 and a crankcase cover 9 comprise the entire body of the engine.

The crankshaft 10 of the engine and its camshaft (not shown) are journaled in bearings in the cover casting 9 and the end wall 11 of the crankcase-cylinder casting opposite the cover; and the flywheel 12 is mounted upon the end of the crankshaft which protrudes from the casting wall 11. The opposite, power take-off end of the crankshaft protrudes from the cover casting. The crankshaft is of conventional construction and is drivingly connected with a piston, not shown, by the customary connecting rod, also not shown.

The cylinder head is of conventional construction with cooling fins cast integrally therewith, and has the usual spark plug 13 mounted therein. The cylinder cooling fins are cast integrally with and encircle the cylinder 7, while other cooling fins are cast integrally with a boss-like portion 14 of the crankcase-cylinder casting. The intake port 15 and the exhaust port 16 are located in this boss-like portion 14 and the front face of the portion 14 is flat and has the attaching flange 17 of the carburetor and air cleaner assembly indicated generally by the numeral 18 bolted thereon.

The flywheel 12 is equipped with the customary fan blades 20 which induce a flow of cooling air into the inlet of a shroud 21 and from the outlet thereof against the adjacent side of the cylinder. The shroud being held in position upon the engine by screws 22 threaded into bosses 23 on the casting. The inlet of the shroud is protected by the customary rotor screen 24, which is preferably mounted upon a rope starter pulley 25 suitably secured to the adjacent end of the crankshaft.

The ignition system of the engine is of the flywheel magneto type and accordingly the flywheel has a permanent magnet 26 embedded in its rim, the pole pieces 26 of which sweep past the three legs 27, 28 and 29 of a laminated armature 30 having the customary coil 31 mounted upon its center legs 28. In the past where flywheel magneto's have been used on engines of this kind it has been customary to assemble the stator of the apparatus upon a mounting plate which in turn was mounted upon the engine. In the present invention the need for such plate mounting of the stator is eliminated by the fact that the stator armature is bolted directly to the side of the crankcase-cylinder casting, and to this end the casting has four supporting posts 32 extending from the side of the cylinder and into which the fastening screws 33 are screwed. The holes in the armature through which the clamping screws pass are sufficiently large to permit the armature to be adjusted as required to give equal definite air gaps between its two outer legs and the rotor.

One end of the high tension secondary of the coil is, of course, connected to the center terminal of the spark plug through the customary spark plug lead 34 and one end of
The primary winding is connected by a lead 35 to one of the contacts of the breaker mechanism indicated generally by the numeral 36 and which, as will be hereinafter more fully described, embodies some rather novel features. The lead 35 must pass under the rim of the flywheel and to do so must be amenable to the same windings as those against which the core 30 of the combined heat shield and guard 37 is provided. This unit is best illustrated in Figure 6. It is mounted in place by being clamped between the armature and the posts 32, the clamping screws 33 passing through holes in flanges 38 which extend from opposite edges of the unit. The main body of the unit lies between the coil and the adjacent side of the cylinder and thus constitutes a heat shield to protect the coil from the heat radiated by the cylinder and to aid in this function the unit is stamped from smooth surfaced aluminum or other highly reflective metal.

The wire guarding function of the unit is performed by an arm 40 projecting from the body of the unit and positioned to lie closely adjacent to the side of the engine over the lead 35 as clearly shown in Figures 1 and 2.

Two of the fastening screws 33 by which the stator armature is held in place also serve to mount a stamping 41 which provides a deflector extending within the air shroud and a mounting 42 for the governor vane (not shown).

The breaker assembly 36 is mounted directly upon the casting side wall 11 and comprises a condenser 43, a breaker arm 44, a pair of normally open breaker contacts or points 45 and 46 and mechanism to effect periodic engagement and disengagement thereof. One of the features of the breaker mechanism resides in the fact that one of the breaker contacts is mounted directly on one end of the condenser 43. This enables the insulating bushing 43' of the condenser to serve a dual function. Not only does it insulate the ungrounded condenser terminal but also the ungrounded breaker contact. In addition this construction enables the condenser mounting to provide for the adjustment of the breaker point spacing for by sliding the condenser axially one way or the other the spacing of the breaker points is quickly and easily adjusted.

To this effect the condenser and breaker point assembly is seated in a cradle formed by round bottomed notches 47 in a pair of parallel ribs 48 cast integral with the wall 11 at one side of a hub 49. The hub 49 is also integral with the wall 11 and forms part of the bearing for the adjacent end of the crankshaft.

A strap 59 arched across the top of the condenser and drawn down tight by a clamping bolt 51 serves to hold the condenser firmly against displacement from any desired position of axial adjustment. To prevent rotation of the strap 50 about the screw 51 during the tightening thereof and during axial motion of the condenser for breaker point adjustment a projection 52 on the outer end of the strap is received between an abutment 53 and the adjacent rib 48.

Endwise adjustment of the condenser, may entail slight loosening of the screw 51. This done, a screw driver or other similar tool may be inserted between a lug 54 and the adjacent end of the condenser so that using the lug as a fulcrum the condenser may be easily slid in a direction to increase the spacing between the breaker points, and the adjacent boss 55 may be used as a fulcrum for sliding the condenser in the opposite direction to decrease the breaker point spacing.

The lug 54 projects from a boss 56 which is radial to the hub 49 and is bored to slideably receive a breaker arm operating pin 57. This pin engages the underside of the breaker arm and rides upon the adjacent surface of the crankshaft to drop down onto a cam 58 in the crankshaft and thereby enable a breaker spring 59 acting on the arm to close momentarily the breaker contacts once each revolution of the crankshaft, good electrical grounding of the breaker arm being assured by a flexible jumper 44' having one end thereof secured to the arm and its other end secured to the pivot for the arm.

The manner in which the breaker arm 44 is mounted exemplifies the extent to which this invention has gone to reduce the cost of an engine and simplify its assembly. As best shown in Figure 5 the breaker arm is stamped from sheet metal and has a wide flat mounting end 60 with a large flat mounting ledge 61 which are received in a longitudinal slot 62 of the armature and a pivot post 63. The post 60 to which one end of the grounding jumper 44' is secured is stepped into a socket 70 in the outer end of a boss 71 cast as an integral part of the wall 11 and a screw 72 passing through the post 63 and threaded into the boss secures the post to the boss.

Correct regular placement of the groove 62 is assured by a small key 73 integral with the boss 71 and extending in from the side of the socket 70 to enter the adjacent end of the groove 62. This locates the post 63 and holds it from turning.

The lead 35 which connects one end of the primary coil with the breaker contact 45, of course, also connects with the adjacent terminal of the condenser, and it is to be understood that the opposite terminal of the condenser is grounded as is also the movable breaker contact (via the jumper 44') and the common terminal of the primary and secondary windings.

The entire breaker mechanism is housed within a dustproof enclosure formed conjointly by a circular rim 74 on the casting wall 11 and a stamped metal cover 75. The cover 75 is in the form of a small inverted cup having a hole in its end wall to accommodate the crankshaft. The edge of this hole is slightly flared and engages a conical edge 76 on the hub 49, and in like manner the peripheral edge of the cup fits a conical edge 78 on the circular rim 74. The parts are of such relative dimensions that upon drawing the cover down in place by two screws 79 threaded into bosses 55 extending up from the wall 11 a firm engagement is first established between the edge of its hole and the hub and thereafter the peripheral edge of the cover is pulled down onto the beveled edge 78 of the circular rim, it being understood that the bottom wall of the cover is sufficiently flexible or resilient to allow such sequential engagement. This achieves a dust-tight fit between the cover and the casting, and to complete enclosure the notch in the edge of the rim 74 through which the lead 35 enters the breaker housing is sealed with a suitable mastic.

To accommodate the mounting for the breaker arm 44 and the condenser 43 the adjacent portions of the end wall of the cover are bulged out as at 80 and 80'.

From the foregoing description taken in connection with the accompanying drawings, it will be readily apparent that due to the simplicity of construction of its components, the ignition system of this invention is so easily assembled and adjusted upon the engine that the assembly time therefor is greatly reduced thus enabling a reduction in production costs of the engine.

What we claim as our invention is:

1. An air cooled internal combustion engine of the character described having its cylinder and at least that wall of the crankcase by which one end of the crankshaft is supported, provided by a single casting which includes heat dissipating fins encircling the cylinder, and having an ignition system including a magneto with a stator and a rotor, the rotor being carried by the crankshaft exteriorly of the crankcase at that end of the shaft which is supported by said designated wall of the cylinder crankcase casting, and having a magnet equipped with pole pieces traveling in a circular orbit, the stator having a multi-legged armature with a coil wound thereon, said engine being characterized by the fact that the stator of the magneto is mounted directly on said cylinder-crankcase casting so that the stator is permanently maintained in a position with the legs of its armature in a predetermined properly spaced relation to the orbit of the pole pieces to be swept thereby, said mounting for the stator comprising mounting bosses form-
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ing an integral part of said cylinder-crankcase casting and projecting from the side thereof adjacent to the orbit of the pole pieces; means fastening the armature of the stator to said mounting bosses; and a thin metal heat shield disposed between the stator and the adjacent side of the cylinder and held in place by being clamped between the stator armature and said mounting bosses.

2. The structure set forth in claim 1 further characterized by the fact that said heat shield has an extended arm projecting beyond the stator and disposed between the rotor and the adjacent side of the engine to provide a guard for a conductor leading from inside the orbit of the pole pieces to the coil and to protect said conductor from coming in contact with the rotor.

3. In an internal combustion engine of the character described having its cylinder and all but one wall of the crankcase formed as one unitary casting, the wall of the crankcase opposite its open side casting, the wall of the crankcase opposite its open side having one of the crankshaft bearings mounted therein and the crankshaft having one end projecting through said bearing, said projecting end of the crankshaft having a magneto rotor mounted thereon, said rotor coacting with a stator having a multi-legged armature with a coil mounted on one of said legs, said engine being characterized by the provision of: mounting bosses cast integral with the cylinder and projecting from the side thereof adjacent to said wall of the crankcase; means directly securing the stator armature to said mounting bosses with its legs in position to coact with the rotor; a sheet metal heat shield interposed between the stator and the adjacent side of the cylinder; the coil of the stator having a lead extending therefrom for connection to the stationary breaker contact of the ignition circuit; a breaker mechanism for the ignition circuit; means mounting said breaker mechanism upon said wall of the crankcase under the rotor, the stationary contact of the breaker mechanism having said lead from the coil connected thereto; and an extension on said heat shield positioned between said lead and the rotor to prevent the lead from contacting the rotor.

References Cited in the file of this patent

UNITED STATES PATENTS

Re. 21,679 Jacobi ---------------- Dec. 31, 1940
1,558,029 Libby et al. ------------------ Oct. 20, 1925
2,433,881 Alstrom ------------------ Jan. 6, 1948
2,483,305 Vollweider ------------------ Sept. 27, 1949
2,570,797 Guillermin -------------- Oct. 9, 1951
2,684,394 Guillermin -------------- July 20, 1954

OTHER REFERENCES

1,473 Australia ------------------ Apr. 17, 1926