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FLYWHEEL MAGNETO

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Fig. 1

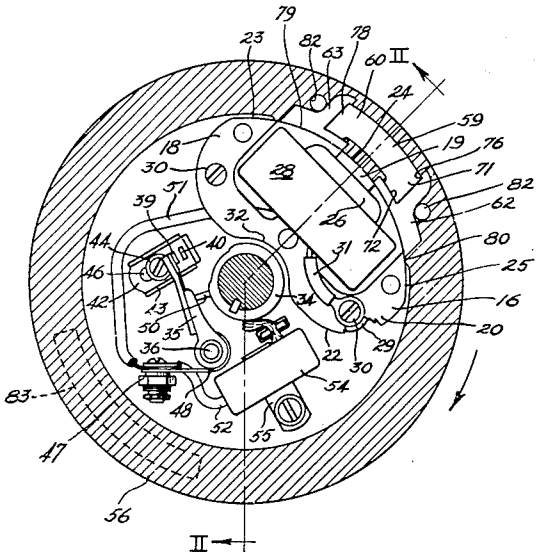


Fig. 2

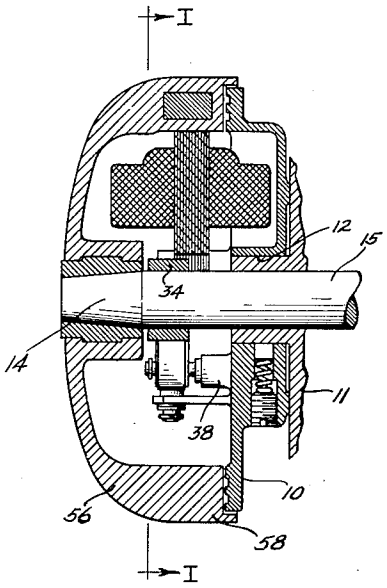
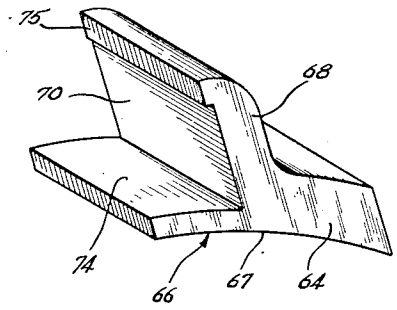


Fig. 3



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FLYWHEEL MAGNETO

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This invention relates to improvements in ignition generators or magnetos, and more particularly to improvements in a flywheel type magneto suitable for use in the ignition systems of relatively small, high speed internal combustion engines.

The primary object of the present invention is to provide an improved, high tension magneto of flywheel form, suitable for small high speed engines and characterized by a compact, low cost assembly embodying novel improvements in the construction and assembly of the flywheel-carried flux producing field portion of the magneto.

Other objects and advantages attained by the present improvements will appear from the following description of a presently preferred embodiment of the invention illustrated by the accompanying drawing, wherein:

Fig. 1 is an end view of the magneto with the flywheel partly in section to reveal the magneto field unit therein, the view being taken along line 1—1 in Fig. 2,

Fig. 2 is a view in longitudinal section through the magneto assembly in operative association with an engine shaft element, the view being taken along line 2—2 in Fig. 2, and

Fig. 3 is a perspective view of one of the magneto field pole shoes.

Referring to the drawings, a flywheel magneto embodying the present improvements is illustrated in assembly relationship of its parts, by Figs. 1 and 2. As there appears, the magneto includes a stationary assembly providing a mounting plate member 10 adapted for attachment to an internal combustion engine with which the magneto is to be used, as to the engine crank case or frame portion 11 shown, in position to receive through the center opening 12 of the plate, the projecting end 14 of the engine shaft 15 which in the present example is the engine crankshaft. Plate member 10 is provided of non-magnetic material as aluminum or a suitable alloy thereof, conveniently die-cast or otherwise formed. Carried by the plate 10 is an armature core member 16 formed from magnetic material and preferably of laminated construction, providing three pole legs 18, 19 and 20 in general parallelism and joined by the common bridge portion 22. The outer ends of the legs 18, 19 and 20 terminate in arcuate polar faces 23, 24 and 25 respectively, and the core member is so disposed on the plate 10 that the polar faces occupy positions of equal radial distance from the center or axis of the plate, as the axis of the shaft-receiving plate opening 12. Suitably mounted on the center leg 19 of the core member 16 is an armature coil unit providing primary winding 26 and secondary winding 28. Mounting of the armature core on plate 10 is here effected through suitable relatively spaced plate bosses, as the boss 29 shown in Fig. 1, to which the core is secured as by the screws 30. One end of the primary winding 26 and an end of the secondary winding 28 are electrically joined and grounded to plate 10 by lead 31 connected advantageously to one of the screws 30. The core bridge section 22 is arcuately recessed at 32 centrally on the side opposite the center

leg 19, to clear the bridge section relative to the shaft end 14 and the circuit breaker cam 34 mounted thereon.

Cam 34 operates the movable contactor arm 35 of the breaker mechanism, the arm preferably of insulation material, being pivotally mounted by a pivot stud 36 carried on a boss 38 of plate 10. Arm 35 supports at its free end, a contact element 39 adapted for cooperation with a fixed contact element 40 on a bracket 42 positionally adjustable on a plate boss 43 through bracket mounting screw 44 which extends through bracket slot 46. Fixed contact 40 is in the ground circuit through plate 10, while the cam actuated contact 39 is in connection to a connector post 47 through a suitable spring conductor element 48 extending between the post 47 and the breaker arm 35. Spring element 48 serves to bias the breaker arm such as to retain its cam-follower element 50 in engagement with cam 34. Post 47 is suitably insulated from plate 10 on which it is mounted, and receives in connection thereto a lead 51 extending from the primary winding 26, and a lead 52 from one end of a condenser 54. The other end of the condenser is grounded to plate 10 through the condenser support bracket 55, thus connecting the condenser in parallel with or across the breaker contacts 39—40.

Mounted on shaft end 14 is a generally cup-shaped rotor member 56 which may be formed to have suitable mass to serve as the engine flywheel where the shaft end 14 is a part of the engine crankshaft. It is constructed from suitable non-magnetic material, preferably metallic as a suitable alloy of aluminum or the like, and includes in the rim portion 58 thereof a magneto field assembly 59. The field assembly comprises a permanent magnet 60 of comparatively short bar form preferably curved substantially in accordance with the curvature of the rotor or flywheel rim 58, and field pole elements or pole shoes 62 and 63 in magnetic connection with the ends of the bar magnet. The short-length bar magnet formed of material known in the trade as "Alnico," is characterized by a high coercive force and superior magnetic retentivity.

A particular feature of the present invention resides in connection with the construction of the pole shoes 62 and 63 and mounting of these shoes with the bar magnet in the rotor rim 58. Each pole shoe is pre-formed, being constructed of finely divided or comminuted magnetic material as iron or suitable ferrous metal, in compressed, sintered form to provide a solid element of the desired shape for magnetic cooperation with the bar magnet 60. Pole shoe 62 which is the leading shoe in respect to the direction of rotor rotation as indicated by the arrow in Fig. 1, presents as shown in Fig. 3, a body section 64 of suitable width in relation to the width of the bar magnet and curved over its length preferably in conformity with the curvature of the rotor rim 58. The side 66 of body portion 64 provides the curved polar face 67 of the shoe for cooperation with the pole faces 23, 24, and 25 of the armature core legs 18, 19 and 20 in flywheel rotation. Moreover, the length of the shoe body 64 is determined with respect to the relative angular spacing of the armature core pole faces, such that the shoe pole face 67 has an arcuate length greater than the angular spacing of the adjacent tips of either adjacent pair of armature core pole faces 23—24 and 24—25. Thus the shoe face is of a length to span the armature legs 18 and 19 or 19 and 20, with slight but appreciable over-lap of the adjacent pole face tips thereof, during flywheel rotation when the shoe face comes opposite the respective pairs of armature pole faces 23—24 and 24—25, as to the position shown in Fig. 1 in respect to armature pole faces 24—25.

Projecting from the back side of the body 64 of pole shoe 62 is a magnet engaging portion 68 presenting a

recessed face **70** for magnetic abutment with end **71** of the bar magnet. In assembly of the shoe and bar magnet, the inner side **72** of the magnet adjacent end **71** thereof, seats against the back side portion **74** of the shoe, while the flange or lip **75** of the shoe portion **68** abuttingly over-laps the opposite outer side **76** of the magnet. Thus the shoe is adapted for effective embrasure of the magnet end **71**.

The pole shoe **63** at the opposite end **78** of the bar magnet, is of like form and construction, and similarly related to the bar magnet end **78**. Shoe **63** differs from shoe **62** only as to the arcuate length of its pole face **79**. In the presently preferred embodiment according to the present invention, the length of pole face **79** of shoe **63** which is here the trailing pole shoe, is slightly less than the angular spacing of the adjacent tips of either adjacent pair of armature core pole faces **23—24** and **24—25**. Thus the pole face of shoe **63** has neither the span nor the overlap characteristics of the shoe **62**.

The bar magnet and its pole shoes arranged as a unit, are embedded in the rim **58** of the rotor or flywheel **56** with only the pole face **67** of shoe **62** and the pole face **79** of shoe **63** exposed at the inner periphery of the rotor rim **58**, as for cooperation with the armature core pole faces **23**, **24** and **25**. Preferably, the inner peripheral surface portion **80** of rotor rim **58** containing the shoe pole faces, is inwardly elevated over the remainder of the inner periphery of the rotor rim, as to the somewhat slight extent illustrated in Fig. 1. In producing the flywheel having the magnet and pole shoes embedded in the flywheel rim, the pole shoes **62** and **63** may be conveniently positioned and held in the heretofore described embracing engagement with the ends of the bar magnet, as by a pair of locating and holding elements or pins (not shown) in confining engagement with the shoes. The pins referred to, preferably are provided as a part of the casting die structure and are arranged so as to position and retain the shoes and bar magnet as a unit, in proper location during the flywheel casting process. When casting is complete and the die is opened or separated for removal of the cast flywheel, the locating and holding pins being fixed to the die, are withdrawn from the cast flywheel, thus leaving the pin openings or voids indicated at **82** in Fig. 1. Hence, the openings **82** are clearly indicative of pin location in respect to the shoes and bar magnet unit during the casting process.

It is again noted that in the final flywheel structure, only the arcuate polar faces **67** and **79** of the pole shoes are exposed. Also and in accordance with the presently improved field structure, the arcuate length of the bar magnet **60** is greater than the arcuate length of the polar faces of either pole shoe **62** and **63**, as this clearly appears in the view of Fig. 1. Furthermore, in die-casting the flywheel a suitable balancing weight element **83**, indicated in dotted outline in Fig. 1, may be embedded in the flywheel rim in a position substantially

diametrically opposite the embedded magnet and pole shoe unit.

Having now described and illustrated a presently preferred embodiment of the invention, what is desired to be claimed and secured by Letters Patent is:

1. In a flywheel assembly for a flywheel magneto, a unitary cast flywheel member formed of non-magnetic material and providing an annular rim, a permanent bar magnet of predetermined relatively short length, a pair of pole shoes each being a pre-formed unitary element of compressed sintered magnetic material, each pole shoe being formed to provide a pole portion presenting an arcuate pole face of a length less than the length of said bar magnet and a portion projecting laterally from the back side of the pole portion and terminating in a flange, said projecting portion and flange cooperating with the part of the pole portion adjacent said projecting portion and underlying said flange, to form a recessed seat for embracing an end of the bar magnet, and said bar magnet and pole shoes having the bar magnet ends in magnetic engagement in the recessed seats of the pole shoes, being cast in situ in said annular rim of the cast flywheel member in a position therein such that only the arcuate pole faces of the pole shoes are exposed at the inner periphery of said annular rim.

2. In a flywheel assembly for a flywheel magneto, a unitary cast flywheel member formed of non-magnetic material and providing an annular rim with an inwardly elevated portion, a permanent bar magnet of predetermined relatively short length, a pair of pole shoes each being a pre-formed unitary element of compressed sintered magnetic material, each pole shoe being formed to provide a pole portion presenting an arcuate pole face of a length less than the length of said bar magnet and a portion projecting laterally from the back side of the pole portion and terminating in a flange, said projecting portion and flange cooperating with the part of the pole portion adjacent said projecting portion and underlying said flange, to form a recessed seat for embracing an end of the bar magnet, and said bar magnet and pole shoes having the bar magnet ends in magnetic engagement in the recessed seats of the pole shoes, being cast in situ in said inwardly elevated portion of the annular rim of the cast flywheel member in a position therein such that only the arcuate pole faces of the pole shoes are exposed at the inner periphery of said annular rim.

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