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IGNITION SPARK ADVANCE

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Fig. 1

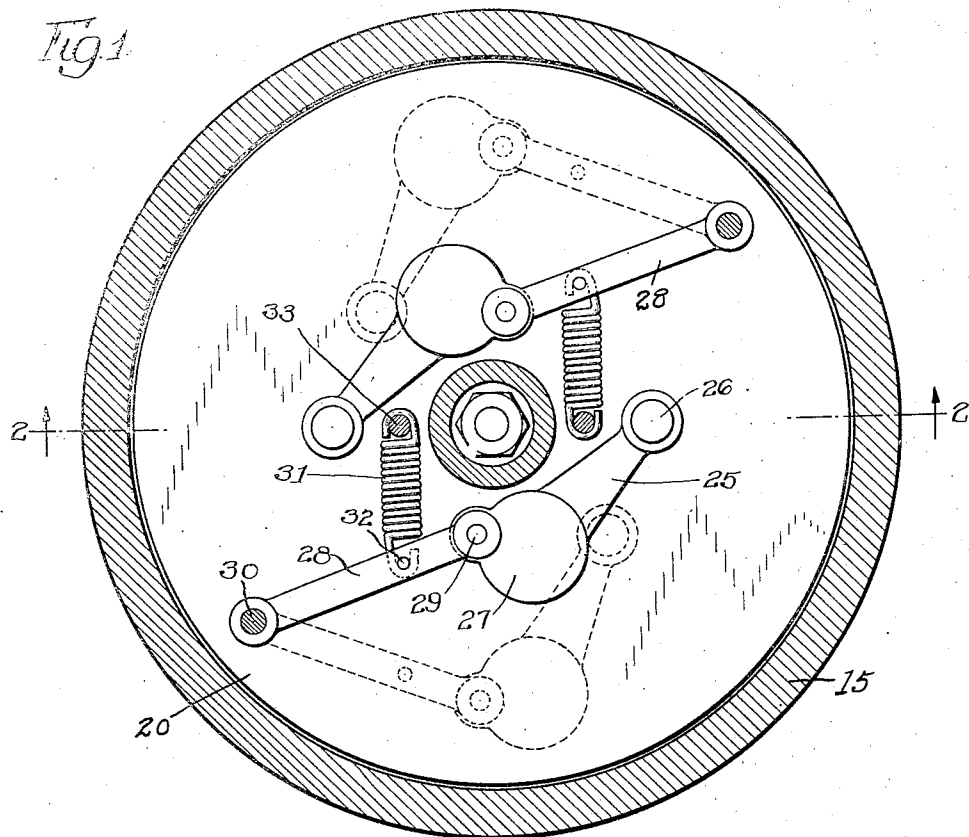
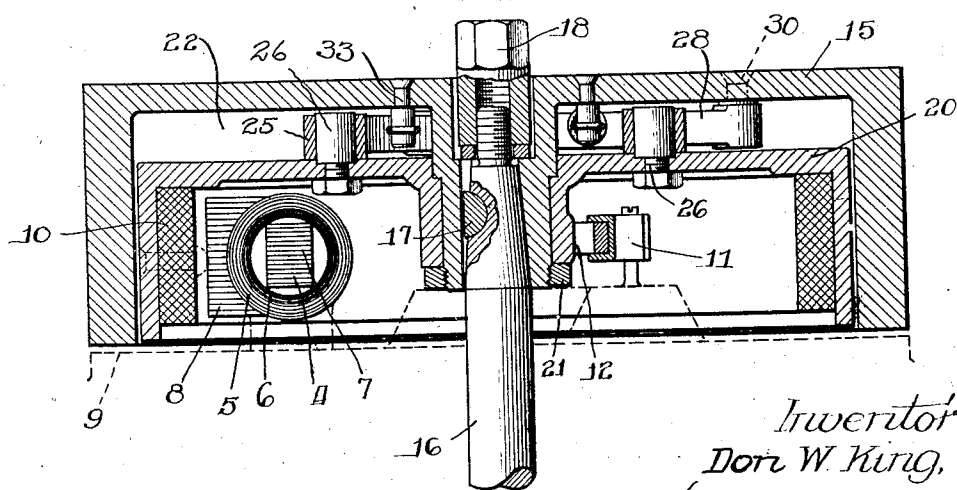


Fig. 2



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IGNITION SPARK ADVANCE

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8 Claims. (Cl. 171-209)

This invention relates in general to the ignition control for an internal combustion engine and has more particular reference to the advancing and retarding of the ignition spark for variation of engine speed.

A further object of the invention is in the provision of means in a flywheel type of magneto for automatically advancing and retarding the ignition spark.

Other objects will appear hereinafter, the preferred construction being illustrated in the accompanying drawing, in which

Fig. 1 shows a section view of the governor parts; and

Fig. 2 is an axial section taken on the line 2-2 of Fig. 1.

Ignition magnetos of the flywheel type are used almost exclusively for ignition purposes in connection with the internal combustion engines of outboard motors. These motors are required to operate over a wide range of speeds and for starting and idling the motor the ignition spark is much later than for higher speeds. The most flexible control of speeds is obtained by a combination of spark and engine throttle control, so that an ideal control system is one in which by simply opening and closing the throttle the spark will automatically adjust itself to the proper timing in accordance with the rapidity with which the engine is operating.

The present invention relates to a system of this kind in which the flywheel is composed of two relatively movable parts or sections between which is an automatic advancing and retarding mechanism.

Referring now more particularly to the drawing, a flywheel magneto consists principally of a spark coil 4 having primary and secondary windings 5 and 6 mounted on a soft iron or laminated core system 7 which has pole pieces 8 all mounted upon a stationary member 9 adjacent to the poles of a rotatable magnet 10 so that the core system is alternately saturated magnetically and then the flux collapsed. A number of types of magnetic circuits are in use and in each type a stationary circuit breaker 11 is caused to open by a rotating cam 12 at some particular phase in the magnetic flux transfer cycle, thus producing a spark which is used for ignition purposes in the internal combustion engine.

The time at which the circuit breaker opening occurs with respect to the flux transfer cycle is fixed for all speeds of rotation but by rotating the spark coil and core system along with the circuit breaker system either relatively forward

or backward about the rotating shaft, the timing of the spark with respect to the engine piston position will be retarded or advanced accordingly.

The same result is obtained if the magnet poles and the cam for operating the circuit breaker are caused to change angular position with respect to the crank shaft. The system described herein is based on this latter principle.

The flywheel consists of two principal parts or sections, an upper heavier section 15 attached rigidly to an engine shaft 16 by means of a key 17 and a nut 18, and a lighter inner flywheel section 20 pivoted to rotate on the internal hub of the outer section and having a threaded collar 21 for holding it in place thereon. The lower section is preferably contained within the outer one and a space 22 is provided between their upper flat surfaces for mounting the ignition variation means therein in a protected position. The lower section carries the magnet 10 and the circuit breaker cam 12 and the upper or outer section 15 should be larger and heavier embodying the greater portion of the flywheel effect.

Connecting the two flywheel sections in the space 22 are two opposite weighted systems, each system comprising a weighted arm 25 mounted on a pivot 26 connected to the inner flywheel section 20 and having a weight 27 at the other end to which one end of a link 28 is connected by a pivot 29, the other end of the link being connected to a pivot 30 attached to the inside of the outer flywheel section adjacent the peripheral edge thereof. A coil spring 31 is connected at one end to a projection 32 intermediate the ends of the link 28 and at its other end to a pin or projection 33 extending from the inside of the outer flywheel section 15.

When the flywheel is rotated centrifugal action throws the weighted arms 25 outwardly toward the positions shown by the broken lines in Fig. 1, the amount of the throw-out being in proportion to the speed and against the action of the springs 31. As the weighted arms move outwardly the distances between the pivots 26 and 30 must be shortened and as these pivots are attached to opposite flywheel sections the magnet 10 carried by the lower section 20 and the cam 12 mounted thereon will be advanced with respect to the driving shaft and also with respect to the magnet armature and core system so that the spark timing with respect to the piston position will be increasingly early until the maximum angle of advance is reached.

Likewise the tension of the springs 31 will cause the spark to be retarded as soon as the engine and

shaft 16 speed is reduced, and will return to the starting point when rotation ceases. Thus the ignition is automatically advanced and retarded in accordance with the engine speed as desired.

5 I claim:

1. In an automatic spark control for engine flywheel magnetos, a pair of flywheel members, one keyed to the engine shaft and the other relatively rotatable thereto, means on the last named member for actuating an ignition device, and weighted spring pressed means between the members operable to rotate them relative to each other, dependent upon the speed of rotation thereof.

2. In a flywheel ignition device, a rotatable engine shaft, a compound flywheel therefor comprising a flywheel member secured to the shaft, a second flywheel member rotatable on the first flywheel member, means for actuating an ignition device on the second flywheel member, and weighted spring pressed links connected together and to each of the flywheel members for moving them angularly with respect to each other, dependent upon the speed of rotation of the shaft.

3. An engine flywheel magneto comprising a shaft, a flywheel member secured to the shaft by means of a hub extension, a second flywheel member mounted within the first one and rotatable upon the hub extension thereof, a pair of links, each connected to one of the flywheel members and the links connected together, and one of the links having a weighted portion which is thrown outwardly by centrifugal force, a spring connected to one of the links and one of the flywheel members for opposing the centrifugal action of the weight, and the weighted links being operable to move the flywheel members relatively to each other dependent upon their speed of rotation.

4. In an automatic ignition spark advance for a flywheel magneto of an internal combustion engine, a pair of flywheel members, one mounted upon the hub and within the other leaving a space between them, an ignition device actuated by one of the members and the other member being secured to the engine shaft, and weighted spring restrained means secured to the flywheel members and located in the space between them for moving them relatively to each other dependent upon engine speed for varying the point of actuation of the said ignition device.

5. In an automatic ignition spark advance for an outboard motor flywheel magneto, a pair of flywheel members, one having a central hub and attached for rotation with the motor, the other member being mounted upon the same axis as the

first member and movable relatively thereto and having a cam for actuating an ignition device, means for angularly varying the position of one member with respect to the other, depending upon engine speed, said means comprising a plurality of pairs of links connected together and the free ends of the links being connected to the flywheel members, the links being weighted to fly outwardly under centrifugal force, a spring connected at one end to one of the members and at the other end to one of the links and tending to restrain the outward movement thereof.

6. A flywheel magneto comprising the combination with outer and inner concentric flywheel members each comprising a disk and a flange, of concentric hubs upon said members in bearing relation to each other, supporting means engaged with the inner hub and connected thereby with the disk of the outer member, coupling means connected between said disks and housed thereby for imparting rotation from the disk of the outer member to the disk of the inner member; said coupling means including a centrifugal device for angularly varying the relative positions of said members, a magnet carried by the flange of the inner member, and a breaker cam mounted on the hub of the inner member.

7. A flywheel magneto including the combination with a shaft mounted hub, of a flywheel comprising a disk and a peripheral flange thereon, a second flywheel housed within the first flywheel and comprising a second hub journaled upon the first mentioned hub, a disk mounted on said second hub in spaced relation to the first mentioned disk and a peripheral flange substantially concentric with the first mentioned flange, centrifugal governor means housed in the space between said disks and including mechanism for coupling said disks for transmitting motion from the outer disk to the second disk and for angularly varying the relative positions of said disks, a magnet carried upon the flange of the second flywheel, and a cam means formed upon the hub of the second flywheel.

8. A fly wheel magneto comprising two flywheel members having complementary parts providing a housing, centrifugal coupling means connecting said members within said housing, and means journalling one of said flywheel members upon the other, one of said flywheel members being provided with a connection to a shaft and the other being provided with a magnet.

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