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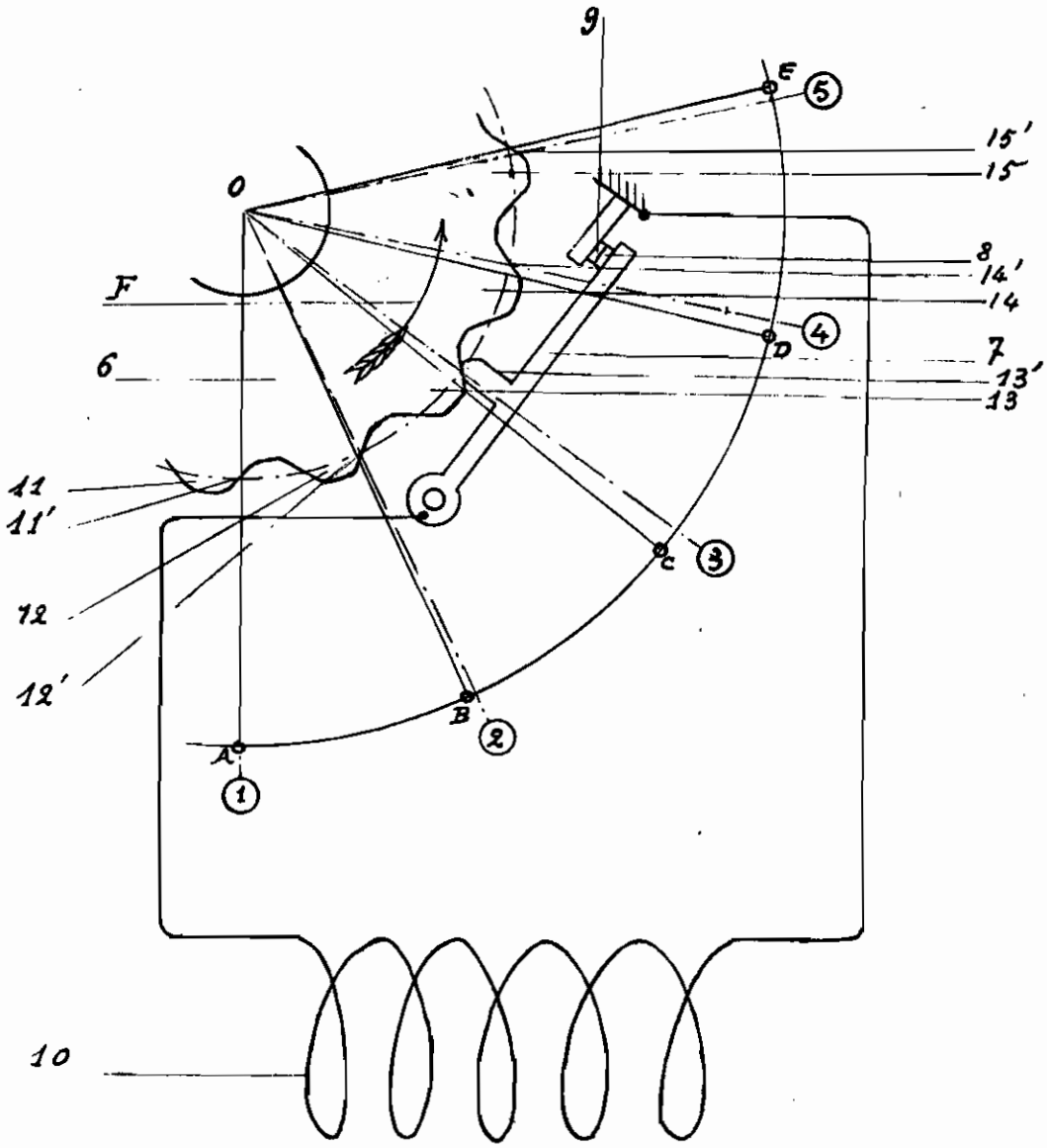

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ALIEN PROPERTY CUSTODIAN

IGNITION SYSTEMS FOR MULTI-CYLINDER ENGINES

Jean Bernard, La Jasse, par Saint Hilaire de Brethmas, Franee; vested in the Alien Property Custodian

Application filed May 21, 1942

The present application forms a continuation-in-part application of my co-pending application Serial No. 202,571, filed April 15, 1938.

My invention relates to the ignition systems for multi-cyclinder engines, such for instance as the present engines with 12, 14, 18 cylinders and so on, in star, V, W, and in a general manner for all engines in which the axes of the cylinders are located in one or a plurality of planes perpendicular to the axes of the crankshaft and are arranged in each plane, along the radii of a circle, and the corresponding pistons of which are connected to the crankshaft through the medium of a master connecting rod and of secondary connecting rods pivoted thereto.

In the engines in question, the passage over the dead centre of a piston in a cylinder other than that of the master connecting rod does not correspond to the passage of the crankshaft pin on the geometrical axis of the cylinder owing to the slant of the secondary connecting rods and takes place either before or after which corresponds on the circular diagram to an angular displacement between the radius representing the geometrical axis of the cylinder and the radius representing the dead centre of the piston.

The object of my invention is to obtain a satisfactory ignition in such an engine and to initiate combustion at the same period of the cycle in each cylinder.

A further object of my invention is to provide interrupting means for controlling the timing of the ignition sparks in said non symmetrical intervals so that the angular spacing between two interruptions corresponds to the irregular angular spacing between the radii representing the dead centres of the pistons.

A still further object of my invention is to provide a compensated rotating interrupting cam in which the bosses corresponding to the various cylinders instead of being equally spaced according to the constant angular spacing between the geometrical axes of the cylinders, are irregularly distributed to compensate the irregularities of the connecting rods; in other words in which the space of time which separates the action of a boss from the action of the boss preceding it corresponds to different angles of rotation of the cam according to the pair of bosses considered.

The flow of ignition current such initiated is distributed by means of a distributing arm for instance which generally is rigidly secured for rotation to the said cam.

In order to facilitate the comprehension of my invention the accompanying drawing shows interrupting means together with a diagram.

As well known, the interrupting means of an ignition magneto includes a cam **6** which cooperates with at least one breaker arm **7**. The said breaker arm **7** is provided with a contact **8** which engages with a stationary contact **9**. The arm **7** and the stationary contact **9** are connected to the terminals of the primary windings of an ignition coil **10**, the secondary winding of which is connected to the various cylinders through a distributor the arm of which rotates with the cam.

In the present instance, the interrupting means are designed to cooperate with a fourteen cylinder star engine, the shafting of which is of the usual type including a master connecting rod directly connecting the crankshaft to one piston and six secondary connecting rods pivoted to said master connecting rod. The secondary connecting rods respectively connect the other pistons to said master connecting rod. The cam **6** is rotated in the direction of the arrow *f* by the said crankshaft to be driven thereby at half the speed of the engine.

It is a known fact that with such a shafting the crankshaft must rotate through successive various angles to successively bring to various pistons to their successive dead centre positions.

The radii OA, OB, OC, OD, OE . . shown in full lines the geometrical axes of the cylinders taken in their order of ignition and the radii O1, O2, O3, O4, O5 . . the positions in which the various pistons pass the dead centre for which positions the ignition sparks should successively occur in the various cylinders if account is not taken of the advance of the sparks. For that purpose, the cam **6** is provided with the bosses **11**, **12**, **13**, **14** . . the engaging faces **11'**, **12'**, **13'**, **14'** of said bosses with the breaker arm **7** (in the direction of the arrow *f*) are respectively arranged according to the radii O1, O2, O3, O4, O5 . ., to interrupt the circuit of the coil **10** and thereby to initiate the combustion in the same period of the cycle in each cyclinder.

The radius OA represents the piston directly connected to the crankshaft through the master connecting rod and the radius O1 consequently coincides with OA. For the other cylinders which correspond to the secondary connecting rods, the radii O2, O3, . . O5 are located either in front of the radii OB, OC, . . or behind. In the present instance the geometrical angular spacing between the cylinder axes is constant and substantially equal to 25°43', the crankshaft must rotate through the following different angles when starting from the cylinder **1** to successively bring the various pistons to their dead point positions illustrated by the radii O2, O3, O4, O5: 52°20', 54°32', 50°, 46°16', 50°, 54°32', and so on. There is thus a forward relative displacement of 54' of the dead centre position in cylinder **2**, a forward relative displacement of 4° in cylinder **3**, and so on.

The positions of the engaging faces **11'**, **12'** . . . of the bosses of the cam, which controls the timing of the ignition sparks are thus determined.

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