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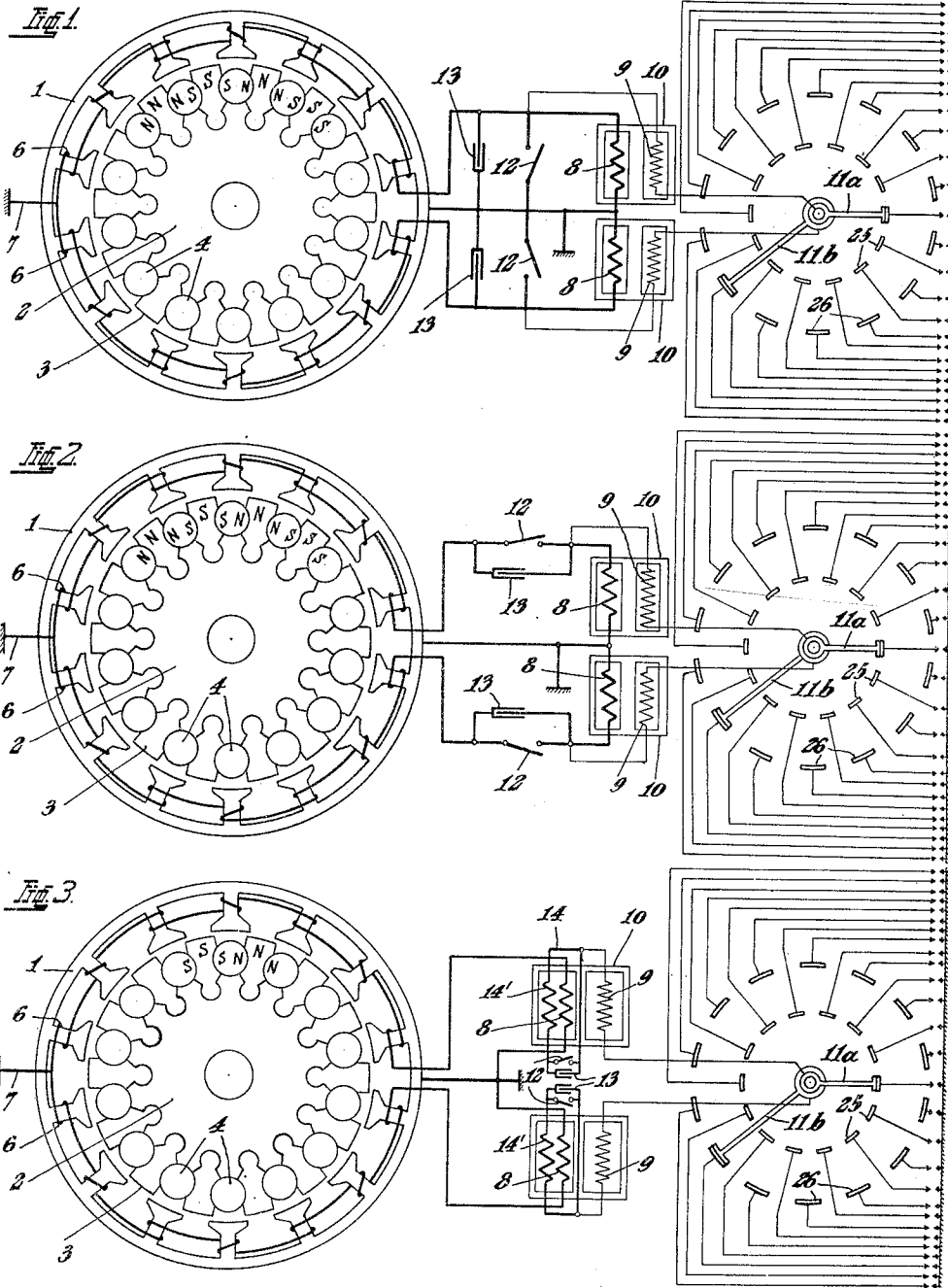
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MULTIPOINT MAGNETO FOR INTERNAL COMBUSTION ENGINES

Filed Nov. 21, 1939

3 Sheets-Sheet 1



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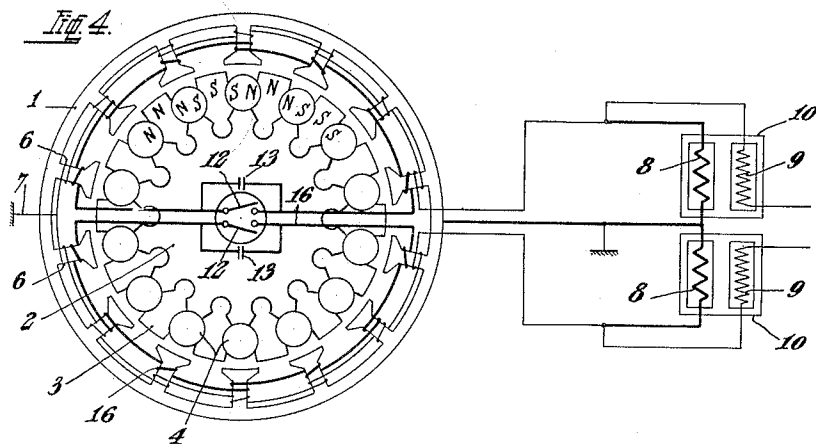
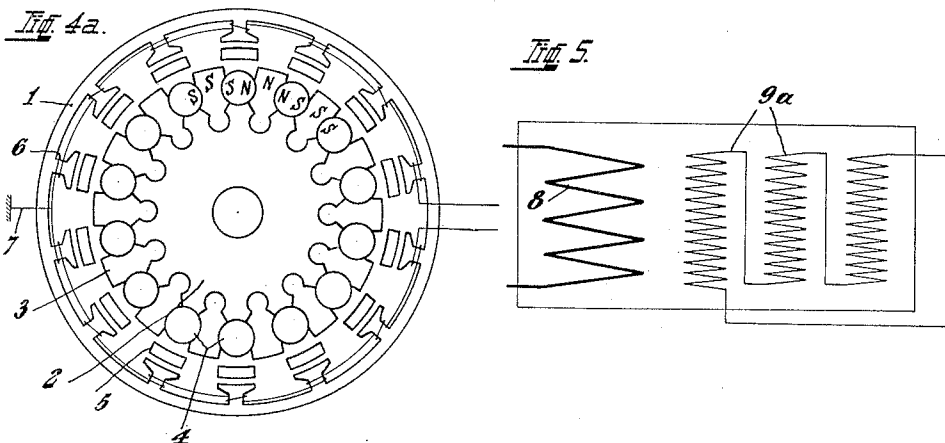
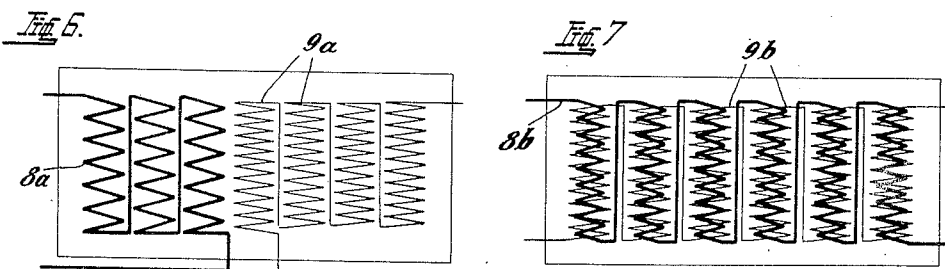
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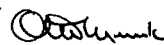
MULTIPOINT MAGNETO FOR INTERNAL COMBUSTION ENGINES

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3 Sheets-Sheet 2



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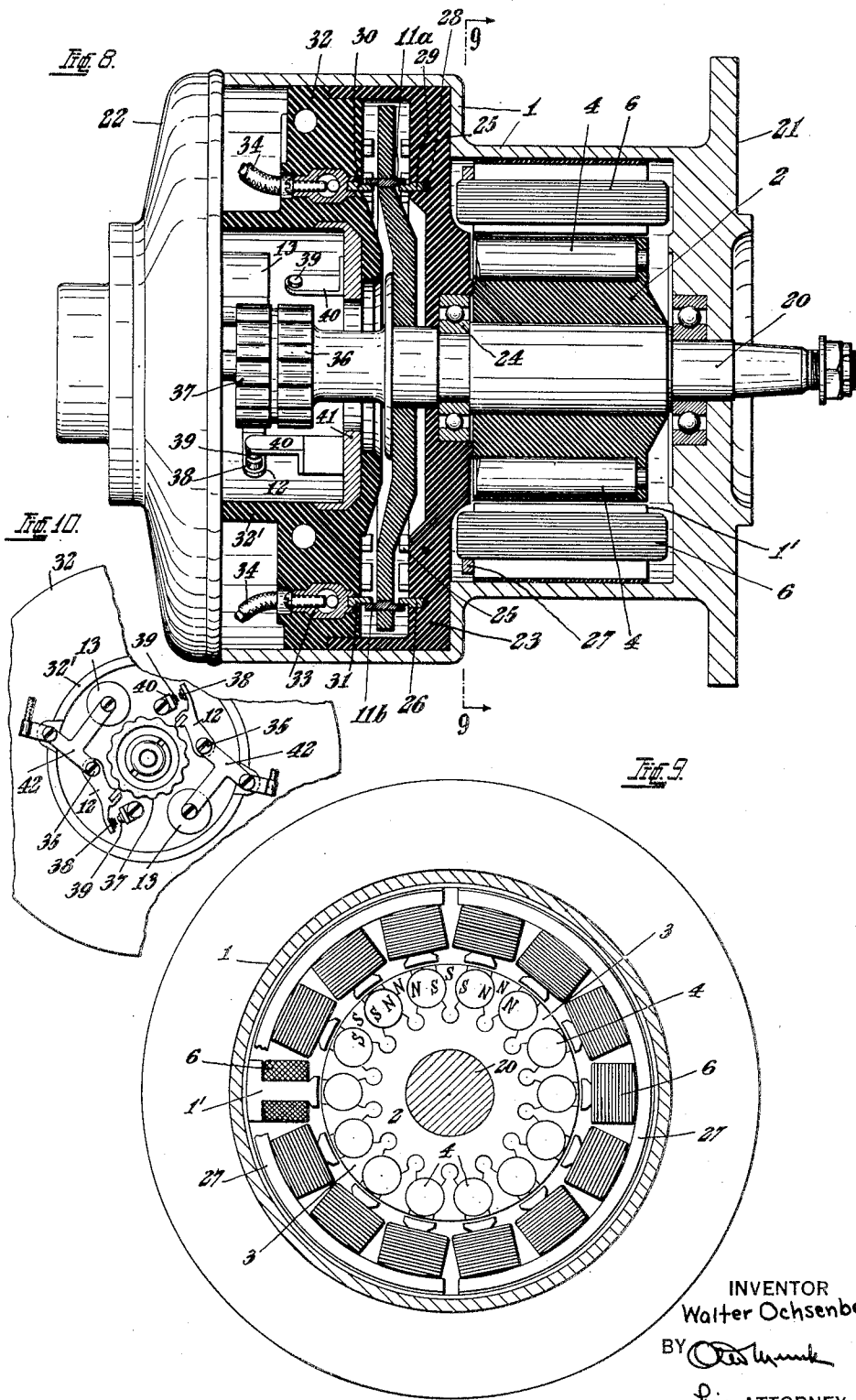
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MULTIPOINT MAGNETO FOR INTERNAL COMBUSTION ENGINES

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3 Sheets-Sheet 3



UNITED STATES PATENT OFFICE

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MULTIPOINT MAGNETO FOR INTERNAL COMBUSTION ENGINES

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6 Claims. (Cl. 123-149)

The present invention relates to a multipoint magneto for internal combustion engines, where the magnet and stator arrangements are multipole. The essence of the invention consists in that the stator arrangement has at least two groups of coils, which coils of each group connected in series, each of said groups cooperating with an ignition transformer.

The annexed drawings represent in the Figs. 1 to 4 four embodiments of the invention and several modifications of details all shown diagrammatically,

Fig. 4a shows a modified ignition generator, Figs. 5 to 7 each show diagrammatically one embodiment of an ignition transformer.

Fig. 8 is a central section of the magneto without the transformer,

Fig. 9 a cross-section on line 9-9 in Fig. 8 and

Fig. 10 shows the arrangement of the circuit breaker levers in Fig. 8, seen from the left and shown at a smaller scale.

In all the illustrated embodiments 1 denotes the stator and 2 the cylindrical magnet carrier arranged concentrically within said stator and carrying on its periphery lamellary pole pieces 3 and between these, longitudinally directed, transversely magnetised, permanent magnet bars 4. In the embodiments according to Figs. 1 to 4 the magnet carrier 2 is designed to be the rotor, from the pole pieces of which the magnetic flux passes directly to the pole shoes 1' of the stator. According to Fig. 4a however the permanent magnet carrier 2 is stationary just like the stator 1, while between the two, there is a gap in which is provided a rotating cage-like flux distributor 5. In all the shown embodiments the number of poles of the magnet-carrier 2 and of the stator 1 is the same, to wit 14, and to this number of poles corresponds also the number of the distributing bars of the flux distributor 5. In the embodiments represented by the Figs. 1 to 3 each stator pole shoe carries a coil 6. These coils form two groups, the coils of each group being connected in series. These groups of coils are grounded at 7.

The other end of each group of coils in the embodiment according to Fig. 1 is connected each with one end to a primary winding 8 and to a secondary winding 9 of an ignition transformer 10. Both ignition transformers are united to form one block. The primary windings 8 of each ignition transformer are connected together at their other ends to the case of the stator which, forming the frame, is also grounded. The other

ends of the secondary windings 9 are connected each with a distributor arm 11a, respectively 11b, of a high tension distributor or ignition current distributor 11 the stationary contacts of which, arranged in a circle, are each connected to a sparking plug cable. In parallel with each stator group winding and the respective primary winding 8 of the ignition transformer 10 is arranged a contact breaker 12 having a condenser 13 likewise connected in parallel. Each contact breaker is controlled by a cam wheel 37 (see Figs. 8 and 10) mounted on the rotor shaft and possessing as many cams as the respective group of the stator has coils or poles. Through the contact breaker, or breakers, the primary circuit of the ignition transformer is alternately short-circuited and opened, whereby high tension current for the generation of ignition sparks will be generated in each ignition circuit.

Figs. 8 and 9 show a longitudinal section and a cross section of the ignition magneto (generator). Same signs of reference indicate same parts as in the Figs. 1 to 3. From Fig. 8 it may be seen that the case forming the stator 1 encloses the rotor 2, the distributor 11 of the ignition current, the two circuit breakers 12 and the condensers 13 connected in parallel to said distributors. The transformer is located outside of the case of the stator 1 and is not represented in the Figs. 8 and 9.

The rotor 2 is fast on a shaft 20 which is supported by bearings in the two end walls of the case 1 and is driven in a generally known manner by means of a not represented intermediate gear at a given ratio from the crank shaft of a combustion engine. Adjacent to the rotor the shaft crosses a partition wall 23 made of insulating material where the shaft 20 is supported in a ball bearing 24. The partition wall 23 carries on its outside and embedded therein contact pieces 25 and 26 arranged at spaced intervals in two concentric circles. In the shown embodiment the rotor shows diametrically magnetised magnet bars 4 between which are inserted lamellary pieces 3. On the outside of the rotor and distributed at spaced intervals on its periphery are fourteen magnet poles 1' of the stator, each carrying a coil 6. Each of two half rings 27 carries seven of said magnet coils. By said half rings 27 the current induced within the stator coils 6 is collected to its half and is lead to the winding 8 of the transformer connected to said coils. Every half ring is of course grounded as is shown at 7 in Figs. 1 to 3. The contacts 25 and 26 in each circle are interconnected by a

circular wire 28 and 29 respectively, each of which is attached to the secondary winding 9 of the respective transformer 10. Within reach of the contacts 25 and 26 the distributor disk 11 carries two contact pieces 11a and 11b respectively which crossing said disk transmit the secondary current from the contacts 25 and 26 to the opposite arranged contacts 30 and 31 respectively when shaft 2 is rotated. The contacts 30 and 31 are embedded, on the side of this disk facing the contacts 25 and 26, into an annular disk 32 made of insulating material and are connected to a cable coupling piece 33. There are two of these coupling pieces and to each is attached a sparking plug cable 34. On the back side of disk 32 this disk is provided with a cylindrical extension 32' within which are disposed, each pivoted to a stud 35, two contact breaker levers 12. Each of these levers bears resiliently with a cog 12' against a cam wheel 36 or 37 respectively mounted on shaft 2 either fast or rotatably adjustable. By said cam wheel contacts 38 of said levers will be alternately broken from counter contacts 39, which are grounded or connected to the other ends of the primary winding 8 of the transformer and attached to brackets 40. These brackets 40 are mounted on an annular disk 41 fast to disk 32. On each of said circuit breaker levers 12 one of the condensers 13 connected in parallel to said levers is attached by a connecting piece 42 connected to the primary winding of the transformer.

The embodiment according to Fig. 2 differs from that in Fig. 1 in that the circuit breakers 12 having the condensers 13 connected in series with them are in series with the respective stator group winding and with the primary coil of the ignition transformer. In this case the primary circuits are alternately broken and closed in order to generate a high tension current in the ignition circuits.

Instead of having the circuit breaker connected in parallel with the condenser or in series with the respective stator group-winding and the primary winding of the ignition transformer, it may be inserted, according to Fig. 3, together with the induction coil 14' into a separate auxiliary oscillatory current loop 14 induced by the primary winding of the ignition transformer, and the secondary winding 9 of the ignition transformer may be connected to the oscillatory circuit 14.

In the embodiment of Fig. 4 each ignition transformer 10 is likewise controlled not directly, but indirectly by an auxiliary control circuit 12, 13, 16, arranged within the generator 1, 2, whereof part 16 consists of a plurality of serially disposed coils of a second winding arranged on the pole shoes of the stator 1. The circuit breakers 12, having the condenser 13 connected in parallel, close and break alternately these auxiliary control circuits such that the coils of the same intensify by induction the energizing of the stator coils 6 in the rhythm of the magnetic impulses and generate thereby an intensified induction of the ignition transformer. If the number of poles of the stator is divisible by two, the number of cams of the circuit breaker wheels may be chosen such, that the ignition transformer is energised only at every second, third, fourth, a. s. f. impulse of the stator winding. This may be the case for instance when the magnet is to be used also for engines having a smaller number of cylinders.

Every ignition transformer may comprise in-

stead of one primary coil and one secondary coil according to Fig. 5 a primary coil and a secondary winding subdivided into a plurality of serially connected coils. Instead of only one primary coil, the primary winding may also be subdivided into a plurality of serially connected coils, as is shown in Fig. 6. Fig. 7 shows an embodiment of an ignition transformer in which the primary and secondary windings are each subdivided into an equal number of serially arranged coils and having wound to each core of the transformer a primary and a secondary winding. The two last mentioned embodiments of the ignition transformer, in which not only the secondary but also the primary winding is subdivided, are employed with particular advantage in generators constructed as described in relation to Fig. 4, where the stator pole shoes carry two coils. By subdividing a winding into a plurality of serially arranged coils the possibility of providing a greater security of the ignition circuits is given, since by subdividing a winding into several coils the danger of failure of the ignition transformer in the case of a breakdown of a coil is prevented. The ignition transformer may be accommodated inside the generator case or may be located outside the same at any convenient place.

In the latter case the connecting leads between ignition transformer and generator are enclosed in a sheathing. Thereby it becomes possible with a view of adapting the generator to relatively limited accommodations to reduce the bulk of the same and to place the ignition transformer elsewhere. By this means the ignition transformer may be protected against additional heating by the engine.

The stator winding may also be subdivided in more than two groups and each group may be connected to an ignition transformer of the herein described designs. Likewise the cams of the circuit breaker wheels may amount to any number divisible by two, to a number contained in the total number of poles, for the purpose of enabling the magneto to be used without alterations, apart from the suitable design of the distributor and of the circuit breaker part, for a smaller number of ignition impulses.

What I claim as new is:

1. A multipoint magneto of the multipole magnet and stator type, comprising in combination, a stator winding comprising at least two coil groups, each including a plurality of serially connected coils, ignition transformers connected with said coil groups, respectively, circuit breakers adapted to control said transformers, respectively, and condensers connected in parallel with said circuit breakers, respectively.

2. A combination according to claim 1, in which each circuit breaker is connected in parallel with a circuit through the corresponding coil group and the primary winding of the corresponding ignition transformer, said combination comprising distributors of the ignition current electrically connected to the secondary winding of said transformers, the primary windings of said transformers being connected to said secondary windings of the same.

3. A combination according to claim 1, in which each circuit breaker is connected in series into the circuit including the corresponding coil group and the primary winding of the corresponding ignition transformer.

4. A combination according to claim 1, comprising an auxiliary current loop induced by the

primary winding of the ignition transformer and including said circuit breaker, and a current distributor connected to the secondary winding of said ignition transformer which is electrically connected to said loop.

5. A combination according to claim 1, in which the secondary winding of the ignition

transformer is subdivided in several serially connected coils.

6. A combination according to claim 1, in which the primary winding of each ignition transformer is subdivided into several of serially connected coils.

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