

March 12, 1935.

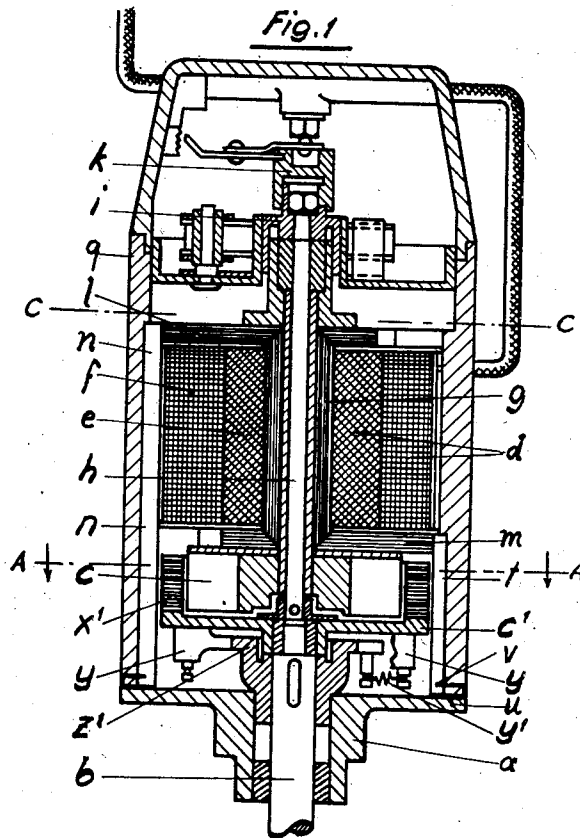
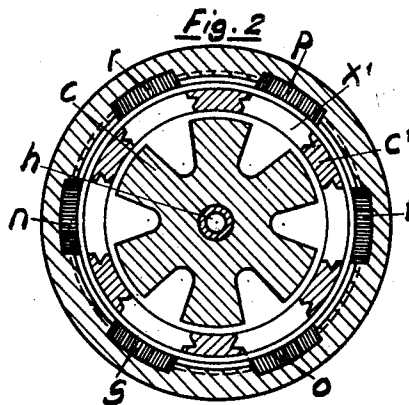
J. BOHLI ET AL

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MAGNETO-ELECTRIC MACHINE

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2 Sheets-Sheet 1



Inventors:

Jacob Rohm
Gottlieb Heiser.

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J. BOHLI ET AL

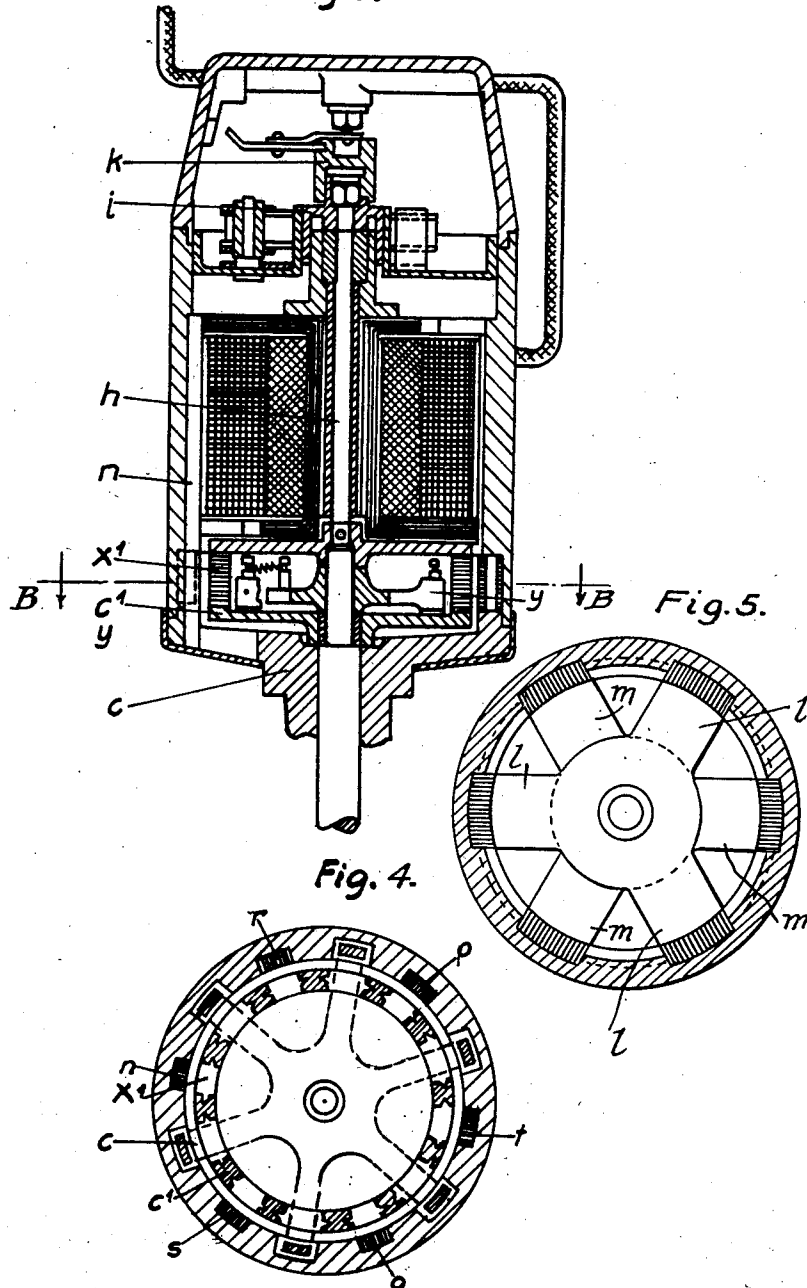
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Fig. 3.



Inventors:

Jakob Bohli
Gottlieb Hering

UNITED STATES PATENT OFFICE

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MAGNETO-ELECTRIC MACHINE

Jakob Bohli and Gottlieb Steiner,
Solothurn, SwitzerlandApplication December 14, 1932, Serial No. 647,205
In Germany December 19, 1931

3 Claims. (Cl. 171-252)

This invention relates to a magneto-electric machine designed especially for use in connection with internal combustion engines and having a stationary armature coil.

In machines of this kind as hitherto known, the armature coil is arranged aside of the rotating member of the device; and the planes in which the windings of the coil are disposed are usually parallel to the axis of rotation. This results in an inconvenient asymmetrical arrangement of such devices, rendering the mounting of said device on the internal combustion engine very difficult. On the other hand, the cross sectionals of iron of the magnetic circuit are considerably limited by the over all dimensions of the device.

The subject of the present invention is a magneto-electric machine, the disadvantages of which are overcome thereby that the axis of the stationary armature coil is provided in the axis of rotation, that the permanent magnet is stationary and axially displaced with respect to the armature coil, that a rotary flux distributor conducts the flux through the coil core by means of magnetic bars which are parallel to the axis of rotation at the outside of the permanent magnet and set apart from each other by an angle corresponding to the pole pitch, these magnetic bars leading alternatively to the adjacent and remote ends of the armature coil where they are connected to the ends of two star shaped magnetic plates which are set apart from each other by one pole pitch.

Fig. 1 is a vertical section through the magneto-electric machine with stationary permanent magnet.

Fig. 2 is a horizontal section on line A—A of Figure 1 viewed in direction of the arrow.

Fig. 3 is a vertical section through a magneto-electric machine with a bell-shaped permanent magnet.

Fig. 4 is a horizontal section on line B—B of Figure 3 viewed in direction of the arrow.

Figure 5 is a horizontal section on line C—C of Figure 1 viewed in direction of the arrow.

In the constructional form shown in Fig. 1 *a* represents the bearing bracket of the device for the driving shaft *b* of the flux distributor *c*. The flux distributor pieces *x* are cast integrally with the flux distributor body. *c* is the stationary permanent magnet. The latter has for instance 6 arms; two adjacent pole arms have opposite polarities. These polarities are indicated on said arms by the letters N, S. *d* is the armature coil comprising the primary winding *e* and

the secondary winding *f*. The permanent magnet *c* is axially displaced with respect to this armature coil *d*. The armature coil has a hollow laminated iron core *g*, which is made of sheet iron wound up in a spiral or consisting of layers of sheet iron. The shaft *h* extends through this hollow coil core and is firmly fixed to the flux distributor *c*. On the end of this shaft the contact breaker *i* for the primary current and the distributor arm for the high-tension current are disposed. Conducting members *l* and *m* respectively, both in the form of a star, are mounted on the ends of the coil core *g* insulated suitably from the coil core, disposed at right angles to the axis of this coil core and displaced angularly by one pole pitch to one another. These conducting bars are laminated i. e. they consist of layers of sheet iron and have, in the present example of a magnetic rotor with 6 poles, three arms each. The ends of the three arms of the conducting member *l* abut upon the three laminated conducting bars *n*, *o*, *p*, which are parallel to the shaft *b* and cast integrally with the magneto-casing *q* which is made of insulating material or non-magnetic metal. By casting the conducting bars into insulating material the conditions with respect to eddy current losses are improved i. e. they are smaller than they would be in metal; these conducting bars are equally spaced apart on the side of the bearing bracket *a* by means of a ring *u* of non-magnetic material, which is cast into the insulating material in the case that the housing *a* is made of insulating material. This ring is U-shaped, the shorter limb *v* of which remote from the flange of the bearing bracket *a* has equally spaced openings for guiding the conducting bars. This ring *u* is at the same time adapted to fix the magneto housing *q* to the bearing bracket *a*. In the case that the housing *q* is made of metal, the ring *u* is not required, and the housing *z* is directly fixed to the bearing support *a*. In the same way as for the conducting member *l*, the conducting member *m* of the same shape abuts upon three laminated conducting bars *r*, *s*, *t*, arranged in parallel to the shaft *b* and cast into the magneto housing *q*. The course of the flux is as follows: At the north poles N of the magnetic wheel *c*, the magnetic flux enters for example through the flux distributor into the conducting bars, *n*, *o*, *p*, from there into the conducting member *l*, through the coil core *g* into the conducting member *m*, into the three conducting bars *v*, *s*, *t*, and from thence through the flux distributor into the three south poles S of the magnetic rotor and back to the north pole N of

the same. After an angular displacement of the magnetic rotor by one pole pitch, in the present example by one sixth of its circumference, the course of the flux in the coil system is reversed with respect to the one described above.

Fig. 2 represents a horizontal section on line A—A of Figure 1. In particular the arrangement of the flux distributor, the magnetic rotor and the conducting bars *n*, *o*, *p* and *r*, *s*, *t*, respectively can be seen; the latter being parallel to the axis of rotation. Figure 5 is a horizontal section on line C—C of Figure 1 and shows in particular the conducting members *m* and *l*. Another constructional form of the device is shown in Figures 3 and 4 of the drawings. In this case the stationary permanent magnet is bell-shaped and serves at the same time as a bearing for the drive-shaft. The arms of this bell-shaped magnet are cast integrally with the magneto-housing in the same manner as the conducting bars; the flux distributor rotates inside these arms passing the magnet poles and the conducting bars which are parallel to the axis of rotation. An automatic spark advance is provided between the drive shaft and the flux distributor to which the drive shaft for the contact breaker and high tension distributor are fixed, which are enclosed by a top cap; this drive shaft extends right through the hollow coil core. For the rest, the arrangement corresponds to that of the preceding examples.

In the examples of a permanent magnet with six arms as described above, three times the sectional area for conducting the flux through the conducting bars and the star-shaped conducting members is available, as compared with the usual arrangements of this kind. Moreover the concentric arrangement of all the main parts of the magneto allows a completely cylindrical shape of the apparatus, thus rendering the mounting into the internal combustion engine very satisfactory.

We wish it to be understood that we do not desire to be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

What we claim is:

1. In a magneto-electric machine, in combination a flux distributor, a drive shaft for the latter, a stationary permanent magnet, magnet arms equally spaced apart and integral with the latter, a flux conducting member, flux conduction arms equally spaced apart by an angle corresponding to twice the angular spacing of the magnet arms and integral with the conducting member, an armature coil axially displaced with respect to said permanent magnet and the axis of winding of which is provided in the axis of rotation, a second flux conducting member, flux conducting bars arranged around said permanent magnet, spaced apart by an angle which corresponds to the angular spacing of the magnet arms and one set of these conducting bars leading from said permanent magnet to the arms of one of the two flux conducting members which are displaced from one another in the direction of rotation as the angular spacing of the magnet arms, the second set of these conducting bars leading to the arms of the second flux conducting member, a coil core, said flux conducting bars, said two flux conducting members and the coil core being in contacting connection with each other and adapted to conduct the flux furnished by said stationary permanent magnet and distributed to the two sets of flux conducting bars by means of said flux distributor through said

armature coil, a bearing bracket for said drive shaft, a ring of non-magnetic metal, a magneto-housing proper, a top cap, said ring being adapted to provide an equal spacing of said flux conducting bars and adapted to fix said magneto-housing to said bearing bracket.

2. In a magneto-electric machine, in combination a flux distributor, a drive shaft for the latter, a stationary permanent magnet, magnet arms equally spaced apart and integral with the latter, a flux conducting member, flux conducting arms equally spaced apart by an angle corresponding to twice the angular spacing of the magnet arms and integral with the conducting member, an armature coil axially displaced with respect to said permanent magnet and the axis of winding of which is provided in the axis of rotation, a second flux conducting member, flux conducting bars arranged around said permanent magnet, spaced apart by an angle which corresponds to the angular spacing of the magnet arms and one set of these conducting bars leading from said permanent magnet to the arms of one of the two flux conducting members which are displaced from one another in the direction of rotation as the angular spacing of the magnet arms, the second set of these conducting bars leading to the arms of the second flux conducting member, a coil core, said flux conducting bars, said two flux conducting members and the coil core being in contacting connection with each other and adapted to conduct the flux furnished by said stationary permanent magnet and distributed to the two sets of flux conducting bars by means of said flux distributor through said armature coil, a bearing bracket for said drive shaft, a ring of non-magnetic metal, a magneto-housing proper made of non-magnetic material, a contact breaker, a high tension distributor, a top cap, said ring being firmly held in the material of said magneto-housing and being U-shaped in cross-section, having uneven lengths of limb, the shorter limb of which has equally spaced openings for guiding the flux-conducting bars which are firmly held in the material of said magneto-housing whilst the longer limb of said ring is adapted to fix said magneto-housing proper to said bearing bracket, a drive shaft for said contact breaker and said high tension distributor being fixed to said flux distributor and extending right through the hollow coil core and the flux conducting members, said top cap enclosing said contact breaker and said high tension distributor.

3. In a magneto-electric machine, in combination a flux distributor, a drive shaft for the latter, a stationary bell-shaped permanent magnet, magnet arms equally spaced apart and integral with the latter, a flux conducting member, flux conducting arms equally spaced apart by an angle corresponding to twice the angular spacing of the magnet arms and integral with the conducting member, an armature coil axially displaced with respect to said permanent magnet and the axis of winding of which is provided in the axis of rotation, a second flux conducting member, flux conducting bars arranged around said permanent magnet, spaced apart by an angle which corresponds to the angular spacing of the magnet arms, one set of these conducting bars leading from said permanent magnet to the arms of one of the two flux conducting members which are displaced from one another in the direction of rotation as the angular spacing of the magnet arms, the second set of these

conducting bars leading to the arms of the second flux conducting member, a coil core, said flux conducting bars, said two flux conducting members and the coil core being in contacting connection with each other and adapted to conduct the flux furnished by said stationary permanent magnet and distributed to the two sets of flux conducting bars by means of said flux distributor through said armature coil, a magneto-housing proper made of non-magnetic material, said magnet arms of the stationary bell-shaped permanent magnet being firmly held in the material of said magneto housing a contact breaker, a high tension distributor, a top cap, a drive shaft for said contact breaker and said high tension distributor being fixed to said flux

distributor and extending right through the hollow coil core and the flux conducting members, said top cap enclosing said contact breaker and said high tension distributor, a bearing bracket for said drive shaft, a ring of non-magnetic metal firmly held in the material of said magneto-housing and U-shaped in cross-section, having uneven lengths of limb, the shorter limb of which has equally spaced openings for guiding the flux conducting bars, which are firmly held in the material of said magneto-housing, whilst the longer limb of said ring is adapted to fix said magneto housing proper to said bearing bracket.

JAKOB BOHLI.
GOTTLIEB STEINER.