

Sept. 3, 1940.

E. A. VOGEL

2,213,724

MAGNETO ROTOR

Filed May 12, 1938

2 Sheets-Sheet 1

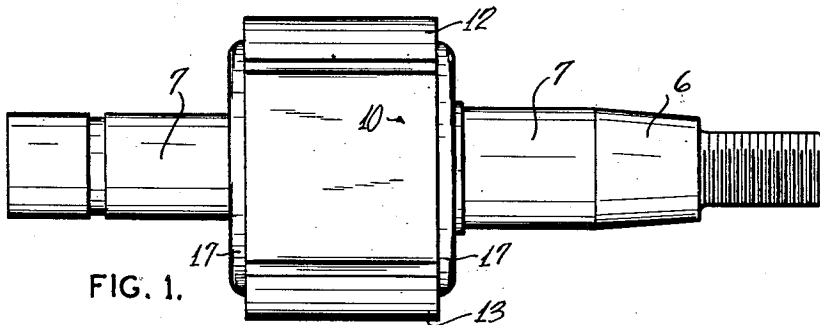


FIG. 1.

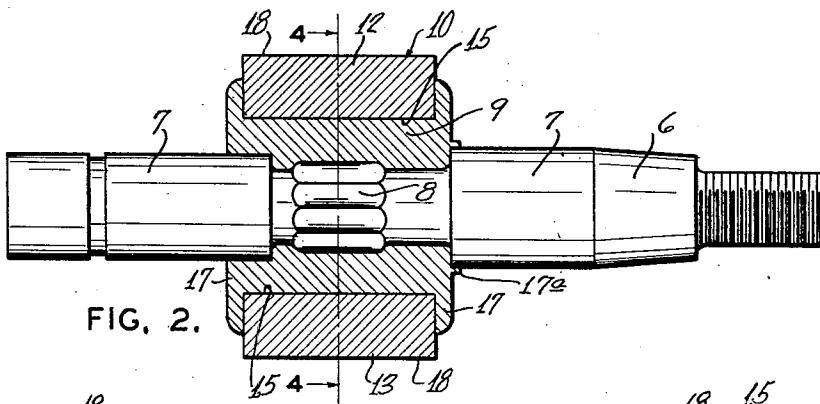


FIG. 2.

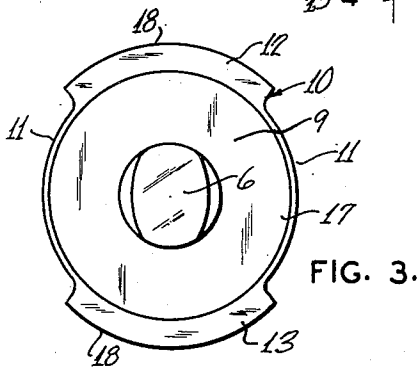


FIG. 3.

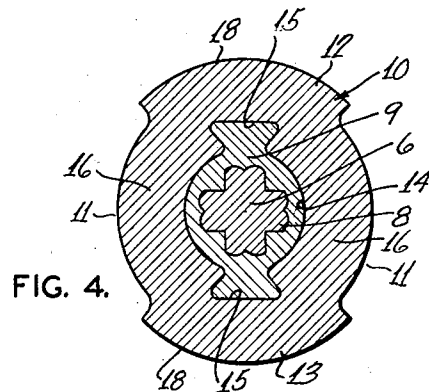


FIG. 4.

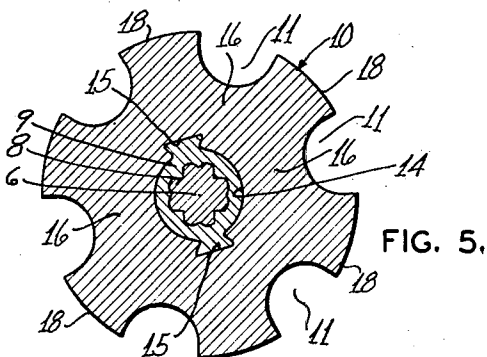


FIG. 5.

INVENTOR

EDWARD A. VOGEL

BY

Paul L. Kuchw

ATTORNEY

Sept. 3, 1940.

E. A. VOGEL

2,213,724

MAGNETO ROTOR

Filed May 12, 1938

2 Sheets-Sheet 2

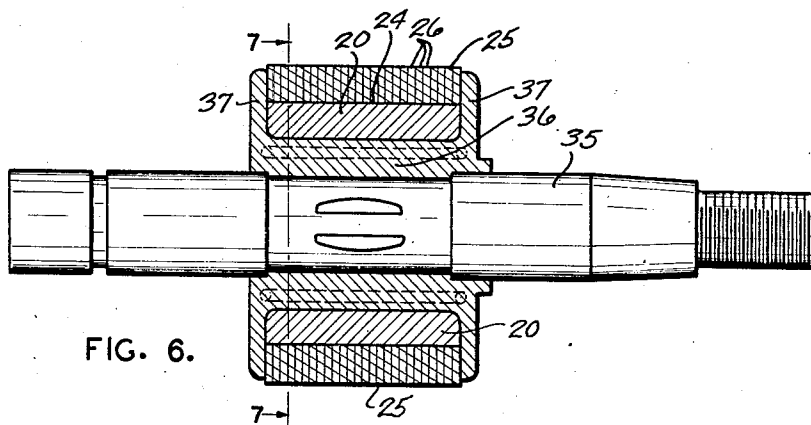


FIG. 6.

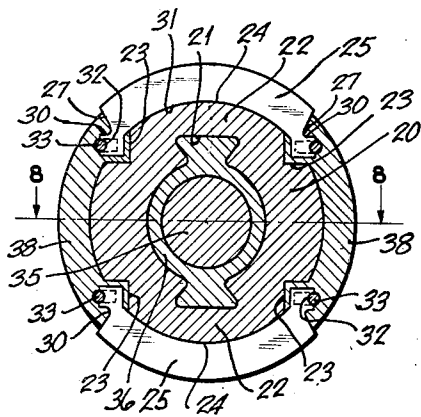


FIG. 7.

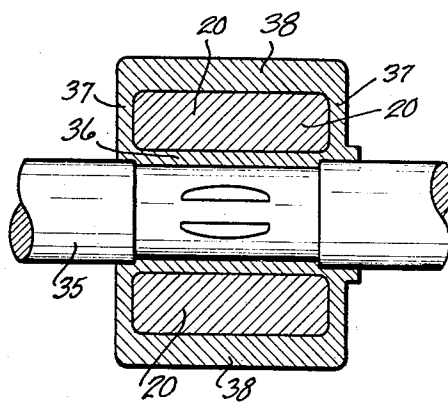


FIG. 8.

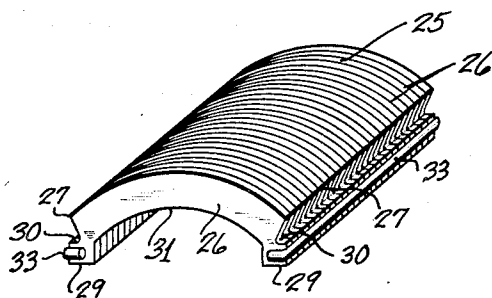


FIG. 9.

INVENTOR

EDWARD A. VOGEL

Paul L. Keshew

BY

ATTORNEY

UNITED STATES PATENT OFFICE

2,213,724

MAGNETO ROTOR

Edward A. Vogel, Beloit, Wis., assignor to Fairbanks, Morse & Co., Chicago, Ill., a corporation of Illinois

Application May 12, 1938, Serial No. 207,548

1 Claim. (Cl. 171—209)

This invention relates to improvements in magneto rotors and involves a rotor wherein the magnetomotive force is produced by a magnetic alloy composed chiefly of aluminum, nickel and cobalt. Such alloy may be formed into permanent magnets having very high unit coercive force, and for this reason is especially suitable for use in the construction of magnetos for ignition purposes where a small, compact, yet highly powerful magneto is desired. Alloys of the character referred to are extremely hard and brittle, and in general cannot be subjected to the usual machining operations, grinding being practically the only satisfactory method of operating on this type of alloy.

The principal object of the invention is to provide an improved magneto rotor construction utilizing an alloy of the aluminum, nickel and cobalt variety for the permanent magnets, the improvements being directed to simplification of manufacture, reduction of cost, and decreasing the size of rotors without impairing their operating efficiency or magnetic output.

Another object is attained in the provision of an improved rotor having relatively few component parts which are integrally connected in the formation of a rigid, unitary structure without the use of bolts, rivets or like securing means.

Further objects and advantages will be apparent from the following description taken in connection with the accompanying drawings, in which:

Fig. 1 is a side elevation of a bi-polar rotor constructed in accordance with my invention; Fig. 2 is a sectional side elevation of the rotor of Fig. 1; Fig. 3 is an end view of the rotor of Fig. 1; Fig. 4 is a transverse sectional view, the section being taken at line 4—4 of Fig. 2; Fig. 5 is a transverse sectional view of a six pole rotor constructed in accordance with my invention; Fig. 6 is a sectional side elevation of a rotor of modified form; Fig. 7 is a transverse section of the rotor of Fig. 6, taken at line 7—7 of that figure; Fig. 8 is a longitudinal section taken at line 8—8 of Fig. 7, and Fig. 9 is a perspective view of a laminated pole shoe employed in the rotor construction of Fig. 6.

Referring now by characters of reference to Figs. 1 to 6 of the drawings, there is illustrated a one-piece shaft 6 of suitable diameter to provide adequate bearing surfaces which are indicated at 7. A length of the shaft between the bearing surfaces 7 may be of reduced diameter as shown, and is characterized by an intermediate

portion 8 of fluted or angulate configuration which is adapted to receive and interlock with a surrounding body of molded, non-magnetic material 9. In other respects shaft 6 may be of conventional form. The magnetic member of the rotor, indicated generally at 10, is formed of an alloy of aluminum, nickel and cobalt, an alloy suitable for the purpose being known and currently available under the name of "Alnico" steel. It is to be understood, however, that any suitable alloy of high coercive magnetic characteristics may be used. The member 10 has the general form of a relatively thick-walled ring or tube, and is given its ultimate shape by casting in a suitable mold, or by compressing the material thereof in a suitable die. Member 10 is initially formed with diametrically disposed recesses 11 which extend the full length of the member and define salient polar portions 12 and 13. A central longitudinal bore 14 in member 10 communicates laterally with undercut or dovetail recesses 15, the recesses being located in radial alignment with the polar portions 12, 13. Such disposition of recesses 15 is desirable because the electrical output of the magneto, and hence the strength of the ignition spark produced thereby, is directly proportioned to the cross-sectional area of the neck portions 16 connecting adjacent poles. It will appear that by arranging the recesses 15 with respect to the polar projections as aforesaid, the cross-sectional area of neck portions 16 is not diminished.

In assembling the rotor, the shaft 6 and magnet member 10 are suitably positioned in the relation of their final assembly in a die-casting mold and the material which makes up the body 9, in molten or plastic condition, is introduced into the mold to fill completely the space between the shaft and magnet member, and to extend over the ends of the magnet member as indicated at 17. My preference is to utilize aluminum or zinc for the body material 9, although any suitable non-magnetic material such as Bakelite may be employed. It will appear that the body 9 interlocks with the magnet member and with the shaft and precludes possibility of either endwise or angular relative movement between these parts. In the formation of the non-magnetic body 9 at least one of the end portions 17 thereof is formed with an annular, axially projecting shoulder 17a which embraces the shaft. The shoulder 17a is adapted to abut a bearing race (not shown) disposed about shaft portion 7, serving to restrict endwise play of the rotor. The shoulder 17a may be readily ma-

chined, if necessary, to attain the desired amount of axial clearance between the rotor and bearing races.

After the body material has become set, the rotor is removed from the assembly mold and the peripheral surfaces 18 of the poles are ground to render them smooth and true. The member 10 is then placed in a magnetic circuit of high intensity to cause the member to become permanently magnetized.

The efficiency of rotors of the general construction illustrated in Figs. 2 and 4 may be improved at small additional manufacturing cost by the provision thereon of laminated pole shoes. Figs. 6 and 9 illustrate the preferred construction and assembly arrangement of a two-pole rotor, thusly modified, the same being described as follows:

The magnetic body member 20 is molded of aluminum-nickel-cobalt alloy, as previously explained, in the form of a relatively thick-walled tube having under-cut recesses 21 extending longitudinally, and opening into the bore thereof. Pole portions 22 are defined between V-shaped grooves 23 that extend longitudinally in the outer cylindrical surface of member 20. The arcuate faces 24 of portions 22 are rendered smooth and true, as by grinding, in order to make good surface contact with the inner faces of the laminated pole shoes 25.

The pole shoes 25 as provided, consist of stacks of sheet steel laminations 26, each of a generally arcuate shape. The opposite end edges 27 of the laminations slope inwardly from their outer peripheral margin 28 to meet the upper edge of projecting portions 29, in the formation of a recess or shoulder 30. In assembly, the inner peripheral margins 31 of the laminations seat upon the arcuate faces 24 of member 20 and the end projections 29 extend into grooves 23. Semi-circular recesses 32 formed in the lateral edges of projections 29 define grooves or seats for receiving fastening elements 33 which serve to hold the laminations together in perfect alignment after assembly thereof in the formation of the pole shoes. The ends of elements 33 are bent or crimped over the sides of the end laminations as best appears from Fig. 9, so as to exert a clamping force which compresses and holds the laminations together in assembled relation. The pole shoes thus described, together with a shaft 35 which, in all essential respects may be identical to the shaft described in connection with the rotor of Fig. 1, are arranged with the magnet member 20 in the positions of their final assembly in a suitable die casting mold.

Non-magnetic body material, preferably of aluminum or zinc, is introduced into the mold to form a matrix which rigidly unites the parts together. The non-magnetic body member, given shape by the die-casting mold in conjunction with the described rotor parts, is characterized by a tubular core 36 having internal and external lateral projections which fill the recesses formed in the shaft and magnetic body, serving to lock these members together; annular discs 37 that embrace the end surfaces of the magnet body and pole shoes; and bridge portions 38 of arcuate section that extend circumferentially between the pole shoes. As best appears from Fig. 7, portions 38 extend laterally about the pole shoe projections 29 in overlapping relation with the shoulders 30 thereof, serving to hold the pole shoes rigidly and tightly against the pole portions of the magnet body.

Magnetization of the rotor is effected after the described assembly process and is accomplished by subjecting the same to a high intensity magnetic field.

Having described my invention, what I claim and desire to secure by Letters Patent is:

In a magneto rotor, a magnet of tubular form having longitudinally extending grooves spaced circumferentially about its outer surface defining polar portions of the magnet, and under-cut recesses extending from its inner surface into the said polar portions, pole shoes of generally arcuate form seated on said polar portions, said pole shoes comprising stacked laminations having longitudinally and laterally off-set end projections extending into said magnet grooves, and U-shaped clamping elements embracing said end projections and uniting the laminations during assembly; a shaft having an intermediate portion of reduced diameter spaced centrally within the magnet, said shaft having longitudinal recesses formed in its reduced portion; and an integral body of non-magnetic metal die-cast in place about the magnet and serving to unite the shaft, magnet and pole shoes, said body comprising a sleeve portion completely filling the space between the shaft and magnet, layer portions covering the outer surface of the magnet between the pole shoes, said layer portions extending over said end projections of the pole shoe laminations whereby to lock them individually to the magnet, and disc portions embracing the opposite end faces of the magnet and pole shoes and interconnecting said sleeve and layer portions of the non-magnetic body.

EDWARD A. VOGEL. 55