March 6, 1934. C. S. TAYLOR 1,950,197

CAST ALUMINUM ROTOR WINDING

Filed Sept. 26, 1931

Fig 1

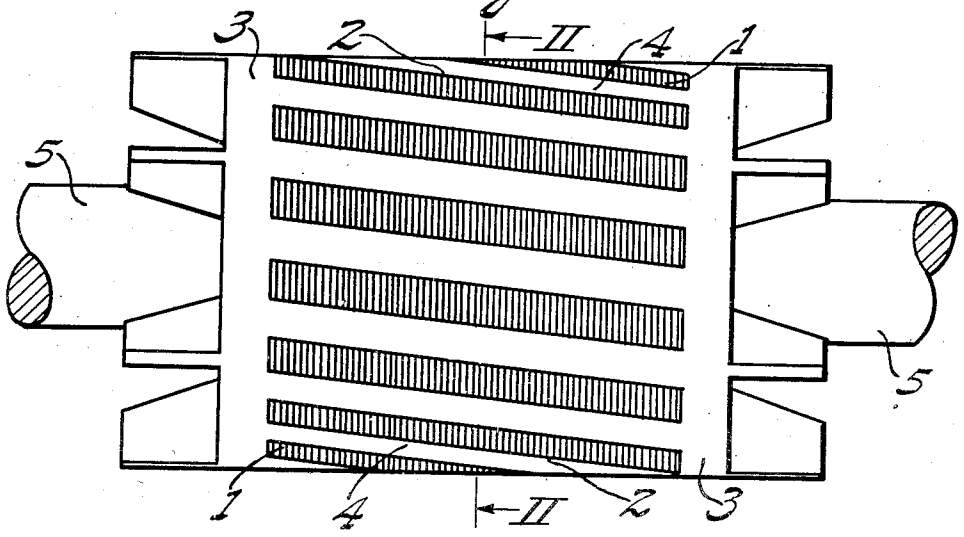
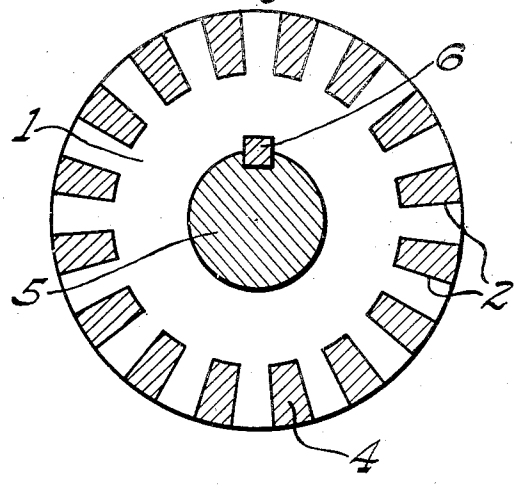


Fig 2



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CAST ALUMINUM ROTOR WINDING

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1 Claim. (Cl. 172—120)

This invention is concerned with the provision of cast aluminum windings for motor rotors, such as rotors of the squirrel cage type. The high rotational velocity under which rotors perform gives rise to problems of design which are in part solved by the use of the light metal, aluminum. Aluminum has had a wide use for rotor manufacture, which use has served to emphasize the difficulties of producing an aluminum winding having a suitable structure and the desired conductivity.

In the well known practice of making rotors, the slotted iron core of the rotor is placed in a mold and molten aluminum is cast around the core and through the core slots to form the cast aluminum winding. In some cases, one of which is the conventional squirrel cage winding, the casting formed is intricate and unequal in section, and in these and other cases certain deficiencies in the casting properties of pure aluminum and some of its alloys have introduced manufacturing problems. Where a winding of high conductivity combined with lightness is desired, pure aluminum or aluminum bearing only the usual and small amounts of impurities, such as iron, silicon and copper, has been used. Aluminum is not, however, particularly suited for casting intricate shapes, especially where soundness and structural uniformity are desired in the final casting, and the problem which has heretofore existed has been the provision of a cast aluminum motor winding of satisfactory soundness and structural uniformity and to provide such a winding which also has a suitably high conductivity.

I provide, as a solution to this problem, a cast motor rotor winding made of aluminum to which has been added a sufficient amount of silicon to bring its silicon content to between about 1 to 3 per cent by weight. The aluminum may contain the impurities found in such metal, such as, for instance, small amounts of iron and copper, and aluminum containing such impurities, as well as pure aluminum, is herein comprehended by the term "aluminum". I have found that a winding may be made of such material with surprising ease; that the cast winding so made is, so long as the silicon content of the aluminum is within the limits named, sound and uniform in structure; and that the winding has an electrical resistivity not over about 4.0 microhms per centimeter cube. As compared with previous cast rotor windings, my new winding possesses very superior properties. It is, even when intricate in design, sound and free from casting defects. It has a uniformity of structure suitable for and compatible with its use as an electrical conductor. It has a conductivity higher than could previously be obtained with a cast rotor winding having the properties above named.

I have, moreover, discovered that the electrical resistivity of my cast aluminum windings, which is not over about 4.0 microhms per centimeter cube and usually about 4.0 to 3.6 microhms, may be considerably improved, if desired, by heating the cast winding at temperatures of about 275 to 325 degrees centigrade. Under the action of this treatment the resistivity of the winding decreases to below about 3.5 microhms and usually becomes about 3.5 to 3.1 microhms. In carrying out such heating treatments, I prefer to heat the winding for about 15 to 25 hours for best results.

An embodiment of my invention is shown by the accompanying drawing in which Fig. 1 is a side view of a common type of induction motor rotor and Fig. 2 is a cross section taken on line II—II of Fig. 1.

The core of the rotor is built up of lamina 1 having circumferential notches 2. In assembling the core the lamina are so positioned that the circumferential notches of the several lamina are in substantial alignment, thus forming longitudinal grooves in the periphery of the rotor. The assembled core is placed in a suitable mold and molten metal introduced which completely fills the grooves 2 and surrounds the ends of the core to form the end rings 3. The solidified metal forms conductor bars 4 in the grooves of the core, integrally united at their ends by end rings 3, the whole casting being known as a cast rotor winding. The rotor is mounted on shaft 5 with a key 6.

Having described my invention, I claim:

A motor rotor comprising a core and a cast aluminum rotor winding containing about 1 to 3 per cent of silicon and characterized by a substantial freedom from casting defects, a structural uniformity and an electrical resistivity not greater than about 4.0 microhms per centimeter cube.

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