No. 716,206.

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F. DOLEZALEK.

INDUCTANCE COIL.

(Application filed July 19, 1902.)

(No Model.)

Fig. 1.

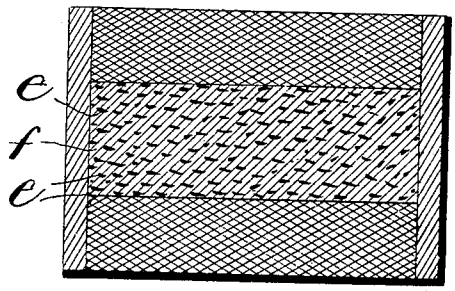


Fig. 2.



WITNESSES:

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INDUCTANCE-COIL.

SPECIFICATION forming part of Letters Patent No. 716,206, dated December 16, 1902.

Application filed July 19, 1902. Serial No. 116,276. (No model.)

To all whom it may concern:

Be it known that I, FRIEDRICH DOLEZALEK, engineer, a subject of the German Emperor, residing at 23 Friedrichsruherstrasse, Halensee, near Berlin, Germany, have invented certain new and useful Improvements in Inductance-Coils; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to inductance-coils, and more especially to that kind of such coils which are usually inserted in cables or long-distance conductors for the purpose of reducing the deleterious effects of the capacity of the cable. With such coils it is of the greatest importance to reduce as much as possible the loss of energy caused by the passage of the current through the coil. The cause of the greater part of these losses is the generation of eddy-currents partly in the conductors themselves which form the winding of coil and partly in the magnetic core on which they are wound.

The present invention consists in a coil the winding of which is formed by a comparatively large number of fine wires placed side by side and also comprises a specific form of core, which is composed of a mass of very finely-divided magnetic material united by an insulating binding substance, so as to form a coherent body.

In the drawings, Figure 1 is a sectional view of an inductance-coil embodying my invention, the particles of fine magnetic material in the core and their distances apart being exaggerated in order to make clear the invention. Fig. 2 is a detail sectional view, on an enlarged scale, of one of the windings.

According to my invention I proceed as follows: In forming the winding of the coil I do not employ a single wire of the required thickness, as was usual hitherto, but rather a number of very fine wires *a*, Fig. 2, placed side by side, so as to be traversed in parallel by the current, and I choose the cross-section of the single wires and their number so as to make the sum-total of their cross-sections substantially equal to the cross-section of the single wire usually employed in such coils. The whole bundle of fine wires is surrounded by a common coating of insulating material of any suitable kind, as indicated at *b*, Fig. 2. The Foucault or eddy currents generated in such a system will run crosswise with relation to the length of the wire, and it will be understood that in order to effectually prevent their generation the single fine wires or threads of metal forming my improved conductor should be insulated from each other, as indicated at *c*, Fig. 2. I have found, however, by experience that for the very small electromotive powers that have to be dealt with the film of oxid which naturally forms on the surface of the wire is a sufficient insulator.

Though I have explained as a general rule that the sum of the cross-sections of the single fine wires together forming the conductor should be substantially equal to the cross-section of the single comparatively thick wire usually employed, in actual practice it will be found that the sum of the cross-sections can be taken somewhat smaller. It is well known that alternating or pulsating currents are not equally distributed over the whole cross-section of the conductor in which they are flowing, but that the current density is greater at the surface than in the interior of the conductor. Therefore the ohmic resistance of a conductor is increased with the periodicity of the alternating current passing through it, or for equal periodicities the ohmic resistance of a conductor will be diminished if the relation between the surface and the cross-section is diminished. Obviously, therefore, if for any given periodicity a bundle of wires of very small diameter sufficiently insulated from each other is used it will be admissible to base the calculation of the total cross-section upon the assumption of a greater specific conductability than if a single-wire solid conductor is employed. By this means the losses of energy in the winding are reduced to the minimum attainable; but it is obvious that eddy-currents will also be generated in the magnetic core on which the herein-described conductor is wound. My invention, therefore, also comprises a new form of core which I have found specially adapted for the purpose set forth.

According to my present invention the core *d*, Fig. 1, is not made of solid iron nor of a bundle of wires or of laminated iron, as has hitherto been usual in such cases. I rather prefer to proceed as follows: The iron or other magnetic material intended to form the core of the spool is ground or filed into a fine powder, and this powder is mixed with any suitable binding substance—such as, for instance, rosin—which besides possessing the required mechanical properties for the purpose is a good insulator. The proportions of the mixture should be so chosen that though every single particle of iron is perfectly surrounded with a coherent film of insulating and binding material the spaces between neighboring particles are nevertheless as small as possible. The mass is shaped into the desired form either by pressing while the binding substance is in a plastic state or else by any usual process of machining after the binding substance has set and the material has acquired a sufficient degree of solidity. The magnetic core thus obtained is employed in the usual way, either by winding the coil upon it or else by inserting it in a coil wound upon a suitable casing.

In Fig. 1 of the drawings some of the fine particles of magnetic material are indicated at *e*, and the insulating material between them and serving as a binding material is indicated at *f*.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. In an inductance-coil for use with alternating currents, the combination, with a magnetic core, of a winding surrounding said core, and composed of a plurality of fine wires enveloped in a common insulating-covering, for the purpose described.

2. In an inductance-coil for use with alternating currents, the combination, with a magnetic core, of a winding surrounding said core, and composed of a plurality of fine wires insulated from each other and enveloped in a common insulating-covering.

3. In an inductance-coil for use with alternating currents, the combination, with a magnetic core of a winding surrounding said core and formed of a plurality of fine wires insulated from each other by films of oxid of the metal of which the wires are composed, said fine wires being enveloped in a common insulating-covering.

4. An inductance-coil for use with alternating currents, having a winding composed of a plurality of fine wires enveloped in a common insulating-covering, the fine wires being insulated from each other.

5. In an inductance-coil for use with alternating currents, the combination, with a magnetic core composed of finely-pulverized magnetic material united by an insulating binding material, of a winding surrounding said core and composed of a plurality of fine wires insulated from each other and provided with a common insulating-covering.

6. In an inductance-coil for use with alternating currents, the combination, with a magnetic core composed of finely-pulverized magnetic material united into a solid body by an insulating binding material, of a winding surrounding said core, said winding being formed from a conductor wound around said core and provided with an insulating-covering, said conductor being composed of a plurality of fine wires insulated from each other.

In testimony whereof I have affixed my signature in presence of two witnesses.

FRIEDRICH DOLEZALEK.

Witnesses:
HENRY HASPER,
WOLDEMAR HAUPT.