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IRON POWDER CORE

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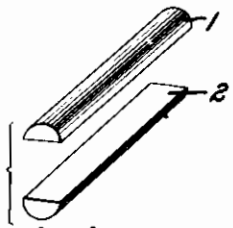

Fig. 1.

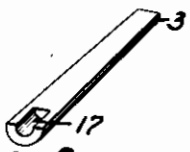

Fig. 2.

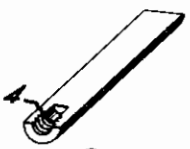

Fig. 3.

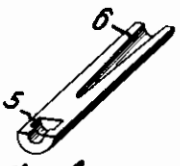

Fig. 4.

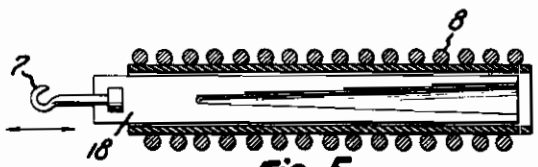

Fig. 5.

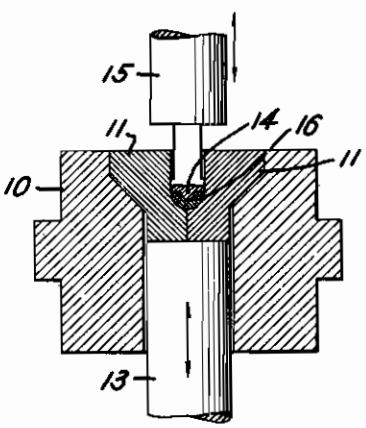

Fig. 6.

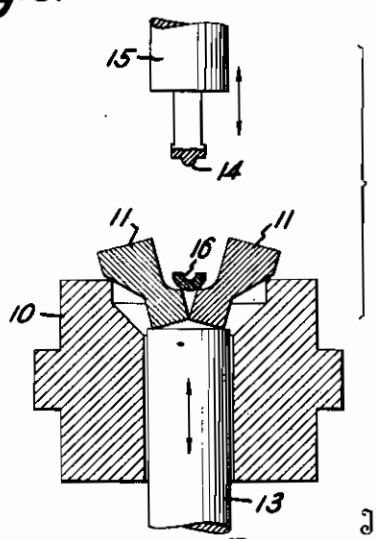

Fig. 7.

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ALIEN PROPERTY CUSTODIAN

IRON POWDER CORE

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This invention relates to an improved iron powder core of the type used for tuning electric resonant circuits in radio receivers and similar apparatus and to a method of producing such cores after the so called permeability tuning method which has been described for instance in U. S. Patents No. 2,082,595 and 2,051,011.

It is an object of the present invention to provide an iron powder core which is easy to make in the oblong shape which is required for permeability tuning purposes.

In order to cover a wave range, for instance, from 200–600 meters a variation of the inductance of at least 1:9 is required. To effect such a great inductance variation, windings of considerable length have been used with oblong pencil-like cores arranged to be moved in the winding. The production of iron dust cores of such longitudinal shape has caused considerable difficulties since the cores are required to combine low losses and high permeability. In many instances cores are required having a permeability above 30 corresponding to a specific density of over 6. The conventional process of compressing the iron powder mixture in a tubular hollow mould by means of a piston sliding in said mould did not give satisfactory results. Owing to the high friction at the walls of the mould the pressure could not be evenly distributed throughout the core structure but the central portion of the core proved to be insufficiently compressed. Moreover, the insulation of the magnetic particles at the surface of the core is liable to injury owing to the friction exerted upon the core surface as the same is ejected from the mould, producing a conductive metal skin which tends to increase the losses in the iron core.

According to the present invention iron dust cores of the type above referred to are made in the form of symmetrical halves which are divided in an axial direction of the core and subsequently united to form a round rod shaped iron core. The core halves are compressed in a direction perpendicularly to the axis of the core and then connected together, preferably with the aid of an adhesive. This method offers the advantage that the cores can be made on automatically operating machines, and can be readily removed from the mould without any danger of injury to the insulation at the surface of the cores. Moreover, the cores can be made with a very uniform structure and, if desired, holes or other recesses of any shape can be provided in the cores. For example, conical bores or undercut bores or threaded bores can be produced. Further, lateral flat faces of tapered or other shape can be provided such as are required, for instance, in order to produce inductance changes of a predetermined characteristic.

The invention will be better understood by reference to the following detailed description in connection with the accompanying drawing showing by way of example and purely schematically some embodiments of the invention and in which

Fig. 1 is a perspective view of two core halves constituting the elements of a core having the invention applied thereto.

Fig. 2, 3 and 4 are modified core halves including central recesses.

Fig. 5 is a central section of a permeability tuning device including a core made in accordance with the present invention.

Fig. 6 is an axial section through a mould adapted for making cores in accordance with the present invention and

Fig. 7 is an axial section similar to Fig. 6, but showing the parts of the mould in another working position.

Referring now to the drawing in greater detail and first to Fig. 1, it will be noted that the oblong core is made of two semi-cylindrical core halves 1 and 2 which may consist of any suitable mixture of magnetic powder and an insulation binder, with or without an individual insulating skin applied on each particle. It should be noted that the term, "iron powder" or "magnetic powder" as used in this specification is intended to comprise any metal or other material whose permeability is greater than 1 and whose high frequency losses are so low that the material may be used in high frequency devices.

Referring to Figures 2, 3 and 4 it will be seen the the core halves in this case are provided with recesses, i. e. the core of Fig. 2 is provided with a cylindrical bore 17, that of Fig. 3 is formed with a threaded bore 4, and the core of Fig. 4 is provided with a differential bore, the diameter of the inner section of the bore being larger. In addition, the recess of the core of Fig. 2 is formed with lateral tapered surfaces 3, while the core of Fig. 4 is formed with a conical bore 6. The tapered surfaces 3 of Fig. 2 and the conical bore 6 of Fig. 4 serve to vary the effective permeability of the core in such a manner that the effective permeability is decreasing towards one end of the core.

Fig. 5 illustrates a permeability tuning device comprising a core 18 which consists of two halves and is provided with tapered lateral surfaces in

accordance with Fig. 2 and with a hook 7 which may be seated in a bore similar to that indicated at 5 in Fig. 4, and a winding 8 having a relatively high ratio of length to diameter.

A very suitable method of making core halves according to the invention will now be described with reference to Figs. 6 and 7.

The pressing tool shown in these figures comprises a casing 10 of hardened steel cheeks 11 making up the mould and received in a recess of the casing, and a lower punch or piston 13. An upper punch 15 is formed with a semi-circular projection 14 to produce recesses like those indicated at 17, 4 and 5 in Figs. 2, 3 and 4 respectively.

This pressing tool operates as follows:

The space in mould 11 is at first filled with a suitable mixture of magnetic powder and a binder. Now the upper punch 15 is moved downwards to compact the powder into a semi-cylindrical shaped article 16. Following the compression punch 15 is retracted and the lower punch 13 is pushed upwards to eject the cheeks 11 as indicated in Fig. 7, whereby the moulded part 16 is set free and may be removed by hand without any injury to its surface. Punch 15 now returns to its initial position, allowing cheeks 11 to assume their initial positions shown in Fig. 6, and the whole cycle of operations may be repeated. A pair of such core halves may now be united, for instance, by glueing them together with the aid of an adhesive which may consist of a solvent adapted to dissolve the insulating binder contained in the core.

My improved method may also be used for the production of hollow and complicated bodies which are made by compressing and sintering metal powder and may be used for any purposes such as bearing bushes.

KURT KASCHKE.