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W. FONDILLER

LOADED CONDUCTOR

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Fig. 1

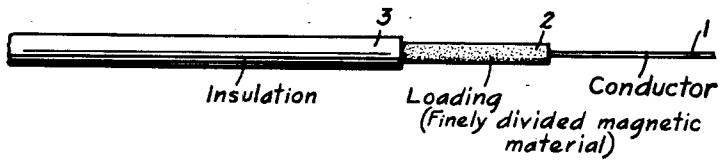
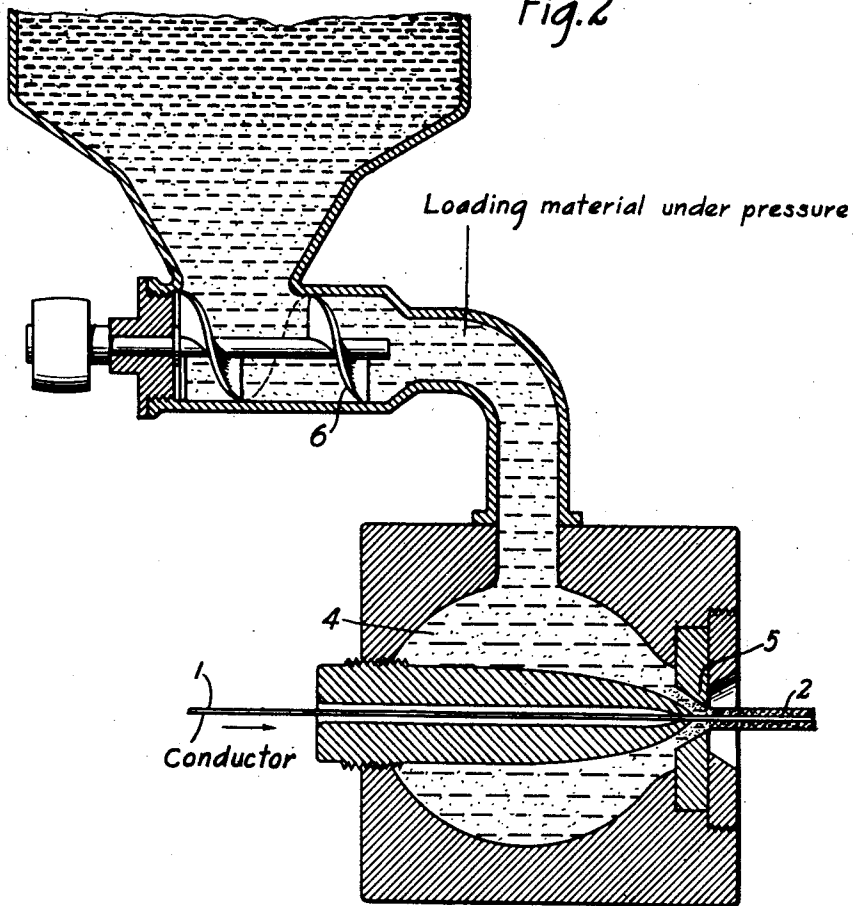


Fig. 2



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LOADED CONDUCTOR.

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This invention relates to loaded conductors, and more especially to such conductors known as continuously loaded conductors.

An object is the production of a continuously loaded conductor which will be efficient in service and economical to manufacture.

A further object of this invention is to provide an electrical conductor which will transmit signals over a wide range of frequencies with small attenuation, and to improve upon known conductors of the continuously loaded type, particularly where relatively light loading is required, for the transmission of higher frequency waves such as are used in carrier systems.

Heretofore, conductors have been continuously loaded by wrapping magnetic material in the form of a tape or wire about the conductor. Another method consists in impregnating the insulating material such as gutta percha, etc., with iron filings. This second method while increasing the inductance reduces the electrical resistance of the insulation to such an extent that the loss through such insulation tends to neutralize the gain effected by the increased inductance.

The present invention contemplates increasing the inductance by applying to the conductor a coating of finely divided magnetic material and at the same time maintaining the resistance of the insulation of the conductor. An advantage of using finely divided magnetic material for continuously loading conductors is that this method limits eddy currents to a point where they are not objectionable even at carrier frequencies of 25,000 cycles or higher.

The magnetic material to be used for this purpose should be in a finely divided condition. Its degree of fineness may approach the colloidal condition but should not be so fine as to reduce the amount of effective magnetic material, due to oxidation, so far as to limit the loading effect. If it is desired to use colloidal iron, special precautions should be taken to protect the iron particles from excessive oxidation.

Iron which serves this purpose quite satisfactorily may be produced by decomposing ferrous oxalate. This is reduced by hydrogen at a temperature of about 300° C. and the resulting finely divided iron is protected from oxidation by immediately immersing it in an inert liquid.

A nickel iron alloy known as permalloy has also been reduced to a fineness suitable for this purpose and may be used instead of pure iron in certain cases.

In the accompanying drawings forming a part of this specification, Fig. 1 shows a portion of a finished conductor in accordance with the invention, partially dissected for illustrative purposes, and Fig. 2 illustrates a method of applying the loading material to the conductor.

Referring to Fig. 1, a portion of the bare conductor is shown at 1. Applied over this is a coating of loading material 2 consisting of finely divided magnetic material over which is applied the installation coating 3.

Referring to Fig. 2, the iron, permalloy and other suitable finely divided magnetic material is preferably mixed with a suitable binder, such as shellac, varnish, enamel, etc., the mixture being indicated at 4. Pressure is applied to this mixture in any suitable manner as by a worm 6, and as the conductor 1 is drawn through the orifice in the direction of the arrow, the loading material is extruded under pressure and by means of the dies 5 is formed into a continuous coating 2 on the conductor.

The subsequent treatment of the conductor will depend upon the binder used, and such treatment may consist of ordinary drying, or in the case of some enamels, baking at a suitable temperature may be necessary.

Previous to the drying operation, a heavy direct current is sent through the conductor. The purpose of this is to align the magnetic particles in the direction of the magnetizing force and thereby increase the permeability of the coating.

After the coating of magnetic material is applied, the conductor is given a coating of insulating material to make it suitable for use in a cable which may consist of a number of such conductors. It will in general be advisable to pass a demagnetizing current through the conductor to remove any magnetic bias due to the aligning current.

What is claimed is:

1. A conductor comprising a conducting core having applied thereto a coating containing loading in the form of iron particles of a degree of fineness approaching the colloidal condition.

2. A conductor for the transmission of electrical signals, comprising a core, a coat-

ing of loading material in the form of finely divided magnetic material and a second coating of insulating material.

3. An electrical conductor comprising a
5 core, a coating of loading material consisting of finely divided magnetic material mixed with a binder and a further coating of flexible insulating material.

4. An electrical conductor having a continuous loading comprising a coating of finely divided magnetic material completely surrounding a metallic core and extending its entire length with an insulating material completely covering said first coating.

15 5. A conductor for the transmission of electrical signals comprising a conductor core, a coating of finely divided magnetic material, the magnetic particles of which have been aligned by the passage of electric current through the core, and over this
20 a second coating of insulating material.

6. A conductor comprising a core having applied thereto a binder containing iron
25 particles for loading said conductor, said particles being of a degree of fineness ap-

proaching the colloidal condition, said binder being adapted to be applied in a fluid state.

7. The method of loading a conductor which consists in applying to the core a
30 binder in a fluid state containing iron particles of a degree of fineness approaching the colloidal condition, and thereafter hardening the binder.

8. The method of loading a conductor
35 comprising reducing the magnetic loading material to a finely divided state, mixing said finely divided material with a binder in a fluid state, and extruding the mixture
40 upon the conductor.

9. The method of loading a conductor which comprises reducing magnetic material to a finely divided state and applying the finely divided magnetic material to the
45 surface of the conductor under pressure.

In witness whereof, I hereunto subscribe my name this 23 day of September A. D., 1924.

WILLIAM FONDILLER.