

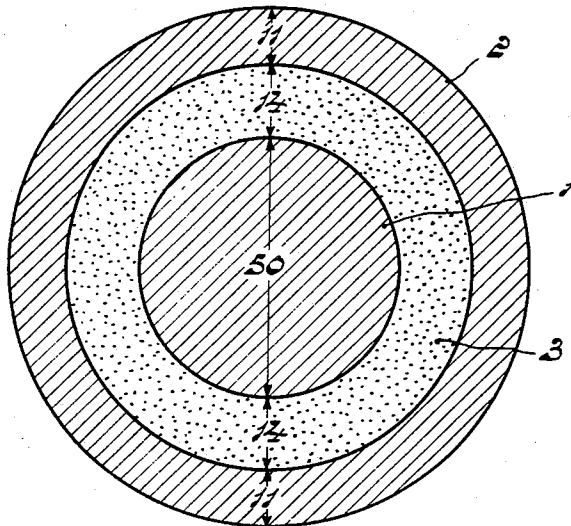
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WIRE-SHAPED OBJECT

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WIRE-SHAPED OBJECT

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4 Claims. (Cl. 29—191.2)

The invention relates to wire-shaped objects comprising a core and a sheath arranged at a certain distance concentrically thereto, these two parts being preferably made of the same material, the space between the core and the sheath comprising a finely divided powder. It is known to use such an object, in which the powder is made of electrically insulating material, for example as a resistance wire in resistors, an indirectly heated cathode in a high-vacuum tube, or as wire capacitors. The construction described makes it possible to manufacture wires of a few tenths of millimeters in thickness in a comparatively simple and cheap manner, i. e. by a series of mechanical operations such, for example, as hammering and subsequent drawing or rolling.

According to the invention the powder is made of permanently magnetizable, ferromagnetic material, the material for the core and the sheath is aluminium or a material, for example a weak kind of copper similar to the former as regards deformability in the cold state and mechanical strength. Apart from the advantages inherent in the known method of manufacturing there is the advantage that owing to the construction, the object according to the invention is particularly suitable to be used as a carrier of magnetic records. In the present case the choice of the sheath material from the series of materials suggested before, for example, nickel, molybdenum or aluminium, is based on the recognition of the fact that during the mechanical operations the intermediate heat-treatments of the wire as are required with other sheath materials such as nickel or molybdenum should not detract from the magnetic properties of the powder. Since aluminium is deformable in cold condition to the degree required for the present case, without becoming brittle and without being cracked or broken, it is well suited for use as sheath material for carriers of magnetic records according to the invention. The use of a weak kind of copper may require an intermediate heat-treatment; in this case the temperature should not exceed 150° C. in order to avoid sintering of the powder and hence a diminution of the magnetic properties. In order to obtain the same advantages for the core and to avoid difficulties in the drawing operation, the core is made of the same material as used for the sheath.

With the object according to the invention and in contradistinction to the known strip-like carriers of magnetic records in which ferromagnetic powder is provided on or in the carrier, the ferromagnetic powder layer to be used for recording or to be provided with records is protected by a sheath. The provision of the sheath has a further advantage in that a binder is not required, so that the filling factor of the space between the core and the sheath may be very high. Since wire-shaped carriers of magnetic records are known to be wound on a reel, the known wire-shaped carriers, in which the ferromagnetic material forms the sheath, bring about the risk of cross-talk owing to the relative contact between adjacent turns. With the wire-shaped carriers according to the invention this disadvantage is sharply reduced, since the magnetic layers

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of adjacent turns are separated by layers of non-magnetic sheath material.

If it is desired to manufacture wire-shaped objects according to the invention with the conventional diameter of wire-shaped carriers of magnetic records lying between 0.2 and 0.05 mm. and with a magnetic powder having a coercive force of at least 300 oersted, the powder according to the invention has a particle magnitude of not more than 2μ , the thickness of the layer being about one-tenth of the outer wire diameter. The choice of the minimum value of the coercive force is connected with the well-known fact that at high frequencies the recording sensitiveness increases with an increasing value of the coercive force. The choice of the thickness of the powder layer is connected with the need for having the greatest possible homogeneity of the stray field of the recording head throughout the thickness of the magnetic layer.

In spite of the strong relative magnetic effect of the particles of the aforesaid magnitude relative to one another which is due to the high coercive force, it has been found that the construction and the manufacturing method of the wire, in which the powder layer is strongly compressed, permits of obtaining a very homogeneous distribution of the particles. Such a homogeneous distribution of the particles having the aforesaid coercive force has not yet been obtained with other carriers of magnetic sound records, so that one had to be satisfied either with the use of particles having a lower value of coercive force in order to ensure a sufficiently homogeneous distribution, or with a higher noise level due to a less homogeneous distribution with the use of particles having a coercive force of a value as referred to in the present case.

In addition to the advantage of a high coercive force owing to the small particle size, the use of particles smaller than 2μ in a wire having an outer diameter of between 0.2 and 0.05 mm., in which the layer thickness is one-tenth of the outer diameter, has the advantage that a comparatively great plurality of particles may be provided in the layer. An excessively small plurality of particles per unit of length of the wire would harmfully affect the noise. It will be obvious that in each case in practice with a particular wire diameter the maximum particle size and the layer thickness have to be adjusted to one another, in accordance with the noise required.

It should be noted that it has been known that the separate particles may have an extremely high coercive force, if iron, iron alloys, nickel, cobalt and so forth or oxides thereof are in a very finely divided condition with a particle size of less than 2μ . It is known to utilize this particle size with the manufacture of powdery magnets and to mould the powder in the desired shape at a temperature at which sintering does not occur. It is furthermore known to use such powdery materials on or in strip-shaped carriers of magnetic records. However, in this case it is found that, as stated above, one has to be satisfied either with a lower value of the coercive force of the particles or with a higher noise level. Carriers according to the invention in which use is made of the said powdery materials, are free from these disadvantages, since owing to the construction of the carrier the particles are strongly compressed in a very homogeneous distribution without the use of a binder.

In order that the invention may be more clearly understood and readily carried into effect, it will now be described more fully with reference to the accompanying drawing, in which one embodiment of the carrier according to the invention is shown.

The drawing shows a core 1 of pure aluminium and a sheath 2 arranged to surround the core concentrically at a certain distance and made of the same material, the space between the two parts being filled up with powdery iron 3. The outer diameter of the sheath was initially

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7.2 mms., the inner diameter 6.2 mms., whereas the core diameter was 3 mms. Subsequent to the rolling and drawing operations the sheath had an outer diameter of 0.1 mm. and an inner diameter of 0.078 mm. The core had a diameter of 0.050 mm., so that the thickness of the powder layer was 0.014 mm. The powder particles had a size of about 0.03 to 0.05 μ and the powder layer had a coercive force of 1100 oersted. A wire manufactured in this manner may readily be twisted into a knot.

What we claim is:

1. A wire-shaped magnetic record carrier comprising an aluminum core, a concentric aluminum sheath spaced from said core and defining an annular space therebetween, and a finely divided permanently magnetizable ferromagnetic material filling said annular space.

2. A wire-shaped magnetic record carrier as claimed in claim 1 in which the ferromagnetic material is powdered iron having a particle size not exceeding 2 μ .

3. A wire-shaped magnetic record carrier as claimed in claim 2 in which the ferromagnetic material has a coercive force of at least 300 oersted.

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4. A wire-shaped magnetic record carrier as claimed in claim 2 in which the outer diameter of the wire is about 0.05 to 0.2 mm. and the thickness of powder in the annular space is about one tenth the outer diameter of the wire.

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