Aug. 16, 1932. A. H. HAROLDSON 1,872,581

RESISTOR MATERIAL AND METHOD OF MAKING THE SAME

Filed March 17, 1930

Fig. 1.

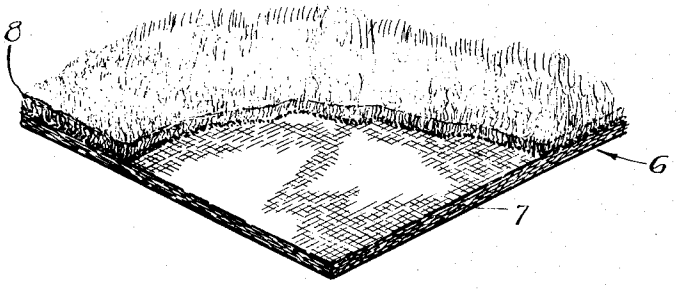


Fig. 2.

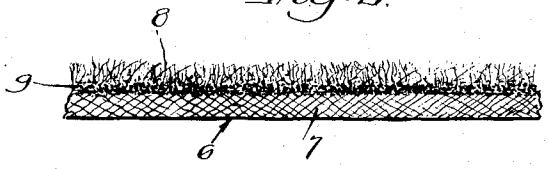


Fig. 3.

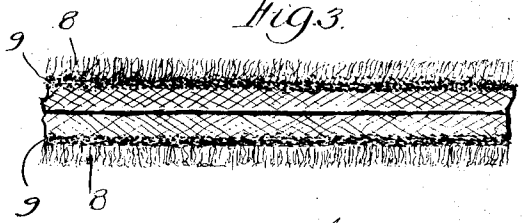


Fig. 4.

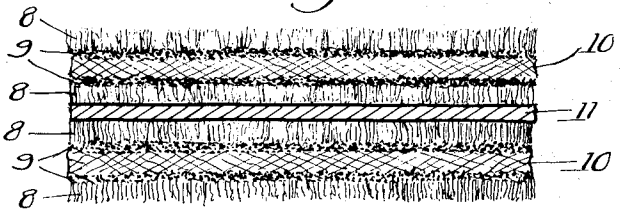
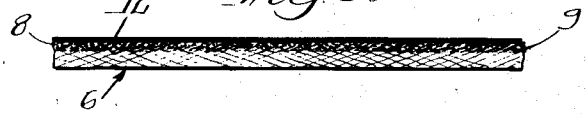


Fig. 5.



Inventor:
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By Cheever, Cox & Moore Attys.

Patented Aug. 16, 1932 1,872,581

UNITED STATES PATENT OFFICE

ARTHUR H. HAROLDSON, OF VALPARAISO, INDIANA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO CONTINENTAL DIAMOND FIBRE COMPANY, OF NEWARK, NEW JERSEY, A CORPORATION OF DELAWARE

RESISTOR MATERIAL AND METHOD OF MAKING THE SAME

Application filed March 17, 1930. Serial No. 436,542.

This invention relates in general to resistor materials and to the method of making and treating fibrous materials with phenol formaldehyde condensation product to provide the resistor material. The treated fibrous material when cured is converted into an insoluble non-fusible material.

The primary object of the invention is to provide a resistor material by treating fibrous materials having a nap or fleece in order to obtain uniform impregnation of the phenol formaldehyde condensation product in the material.

Another object is to provide a method of treating a fleeced or napped material with a non-conductive varnish, such as phenol formaldehyde condensation product, and including in the material either directly thereon or in the varnish, a conductive material, such as graphite, carbon, and the like.

Another object is to provide a method of treating a fleeced or napped material, which consists in immersing the material in a phenol formaldehyde condensation product, such as commercially known "Bakelite", including in the varnish a conductive material, such as carbon, graphite, or any other conductive materials like separated copper, or other metals, subjecting the material so treated to an evaporating or drying operation to partially cure the material, and finally subjecting the material to a heat and pressure operation to produce an insoluble non-fusible relatively conductive material.

Numerous other objects and advantages will be apparent throughout the progress of the following specification:

The invention comprises in general a method of treating material having a nap or fleece. An example of material of this type is cotton flannel. This cotton flannel is passed through a bath of phenol formaldehyde condensation product, in which graphite, carbon, or other conductive material may be mixed. The conductive material becomes imbedded at the base of the nap and becomes thoroughly saturated with the varnish due to its absorbing qualities. The material so treated is then subjected to a heating operation to partially cure it. It is then subjected to a heat and pressure operation to convert the material into an insoluble non-fusible mass. This napped or fleeced material absorbs the varnish more uniformly and equally distributes the graphite or carbon which is mixed in the varnish over the entire napped surface.

The napped material may be of the type which is napped on one side only, or may be the kind which is fleeced or napped on both sides. Panels may be built up from the finished material, and in building up the panels the material may have a fibrous filler of any kind, such as cloth, paper, or other like material. It has been found preferable, when using a material which is napped on one side, that the material be placed back to back to form the panel or laminated finished article, as the nap compresses equally and uniformly during the heat and pressure operation, and provides a very smooth and even surface when finished, the fleece being bent over and imbedded into the body of the material or fabric during the final step of the method, which consists in subjecting the material to heat and pressure.

The accompanying drawing illustrates a selected embodiment of the invention for carrying out the method, and the views therein are as follows:

Fig. 1 is a detail perspective view showing a piece of fibrous material fleeced on one side showing the manner in which the material enters the base of the nap and absorbs the varnish; parts being broken away for the sake of clearness.

Fig. 2 is a detail sectional view of the material shown in Fig. 1.

Fig. 3 is a detail sectional view of two pieces of material fleeced on one side and arranged back to back.

Fig. 4 is a detail sectional view of two pieces of double fleeced material with a fibrous filler arranged therebetween.

Fig. 5 is a detail sectional view of the material shown in Fig. 1 after it is finally cured and pressed.

In carrying out the invention, a piece of napped or fleeced material 6, Figs. 1 and 2, having a base or warp 7 and upstanding

fibers 8, is passed through a varnish bath of phenol formaldehyde. This bath may have included therein a conductive material, such as graphite, metals, or the like. This conductive material 9 (indicated in stippling) becomes imbedded at the base of the nap, and due to the rough or fleecy surface of the material a relatively large amount of the graphite or other conductive material becomes thoroughly imbedded in the material.

In laminating the material it has been found that by placing the material back to back, a thorough bond is made between the material, and the fleeced surfaces or the nap of the material is able to gather, absorb, and hold more of the varnish and conductor.

Instead of using material which has the fleece on one side thereof, the material may be fleeced on both sides as indicated at 10, Fig. 4. To increase the thickness of the finished product a fibrous filler 11, such as paper or cloth, may be arranged between the layers of the fleeced material, and this layer formation may be increased layer upon layer to obtain the thickness desired.

After the material has been passed through the bath it then has the excess varnish wiped therefrom and is placed in an oven to drive off the solvent and to partially cure the material. The material is then subjected to a heat and pressure operation, whereby the material will be converted into an insoluble non-fusible mass.

The pressing and heating operation provides a hard smooth top 12, Fig. 5, and presses down the nap or fleece 8, causing the conductor 9 to be pressed to the surface of the finished product by the bending down of the nap.

Fleeced or napped material, as set forth in this present case, is particularly useful for making colored bakelite panels by impregnating the napped or fleeced material with a phenol formaldehyde varnish or other synthetic resin containing a dye or a pigment. The coloring of fleeced material may be done in any manner desired, but it is particularly done in the manner set forth in a copending application, Serial No. 425,718, filed February 3, 1930.

The fleeced material provides a smooth surface which is free from blotches or grains. Paper usually gives a slightly blotched surface due to its non-uniformity, and when ordinary cloth is used, the weave of the cloth is reproduced in the finished product. The fleeced or napped material, however, produces a surface of one solid color free from the defects which are usually obtained when paper or ordinary cloth is used.

It has also been found that the material can be used to good advantage without the use of any conductive material, such as graphite, carbon, and the like, the material being put through the varnish bath in the usual manner. The napped material absorbs the varnish more uniformly and causes it to be uniformly distributed and eliminates resin pockets.

The material is particularly adapted for use as a resistor for radio volume controls, rheostats, and other similar articles. Material of the present kind is particularly adapted for use in resistors, such as claimed and disclosed in the copending application, Serial No. 413,714, filed December 13, 1929, and assigned to the present assignee.

The invention provides a material which can be easily handled, which is economical to use, and which provides a hard uniform smooth finished product.

Changes may be made in the various steps in carrying out the process, and any material having a napped or fleeced surface may be substituted for the specific fabric mentioned herein without departing from the scope of the invention or sacrificing any of its advantages, and the right is hereby reserved to make all such changes as fairly fall within the scope of the following claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. Resistor material comprising fibrous material having a nap, finely divided conducting material imbedded in the base of said nap, and a phenol and formaldehyde condensation product applied to said fibrous material for converting the resistor material into an insoluble non-fusible product.

2. An electric resistance comprising fibrous material having a nap impregnated with a synthetic resin in its final inert state having an amorphous or powdered conducting material uniformly distributed therein.

3. Resistor material comprising a fibrous base having a nap, a synthetic resin and graphite, the graphite being uniformly distributed throughout the synthetic resin and said fibrous material including the nap being uniformly impregnated with the synthetic resin whereby the graphite is uniformly distributed throughout the nap, and the synthetic resin being cured to its final inert state whereby to produce a final compact resistor.

4. The method of producing resistance material for volume controls, rheostats and the like, which consists in uniformly impregnating a sheet of fleeced fibrous material with a synthetic resin having an amorphous conducting material suspended therein, said synthetic resin being in its initial uncured condition and thereafter treating the impregnated fleeced material with heat and pressure to convert the synthetic resin to its final inert state whereby, in the final product, the amorphous conducting material is uniformly distributed throughout the fleeced

or napped portion of the fibrous material.

5. The method of making resistance material, which consists in applying to a backing strip, comprising a fleeced fabric, a synthetic resin in its initial condition having an amorphous or powdered conducting material, such as graphite, uniformly distributed throughout the synthetic resin in order to distribute the finely divided conducting material uniformly throughout the fleeced portion of the fabric and thereafter treating the impregnated fabric to convert the synthetic resin to its final inert state.

6. The method of producing resistance material for volume controls, rheostats and the like, which consists in uniformly impregnating a sheet of fleeced fibrous material with a phenolic resin having an amorphous conducting material suspended therein, said phenolic resin being in its initial uncured condition and thereafter treating the impregnated fleeced material with heat and pressure to convert the phenolic resin to its final state whereby, in the final product, the amorpohus conducting material is uniformly distributed throughout the fleeced or napped portion of the fibrous material.

7. The method of making resistance material, which consists in applying to a backing strip, comprising a fleeced fabric, a phenolic resin in its initial condition having an amorphous conducting material, such as graphite, uniformly distributed throughout the phenolic resin in order to distribute the finely divided conducting material uniformly throughout the fleeced portion of the fabric and thereafter treating the impregnated fabric to convert the phenolic resin to its final inert state.

In witness whereof, I have hereunto subscribed my name.

ARTHUR H. HAROLDSON.

CERTIFICATE OF CORRECTION.

Patent No. 1,872,581. **August 16, 1932.**

ARTHUR H. HAROLDSON.

It is hereby certified that the residence of the assignee by mesne assignments in the above numbered patent was erroneously described and specified as "Newark, New Jersey", whereas said residence should have been described and specified as "Newark, Delaware", as shown by the records of assignments in this office; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 29th day of November, A. D. 1932.

(Seal)

M. J. Moore,
Acting Commissioner of Patents.