July 22, 1930.

L. V. ADAMS

1,771,367

FLEXIBLE INSULATING MATERIAL

Filed Nov. 8, 1926

Fig. 1.

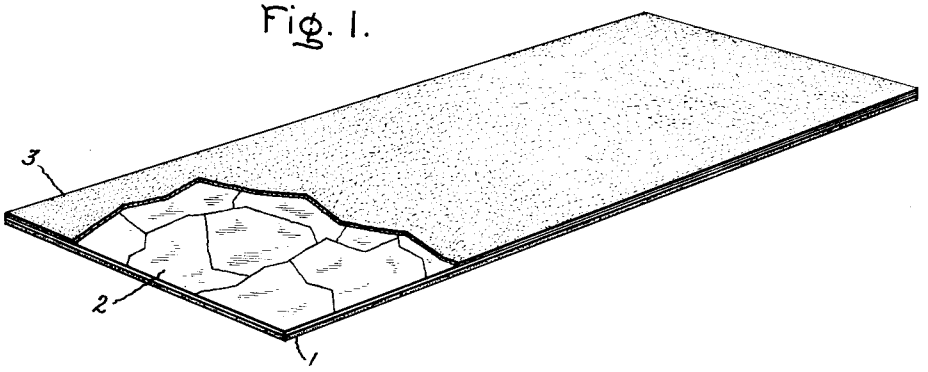
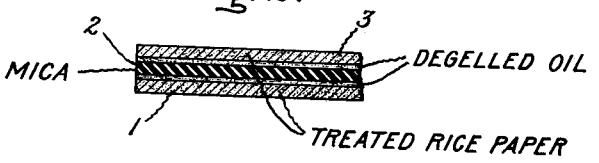


Fig. 2.



Inventor:

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UNITED STATES PATENT OFFICE

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FLEXIBLE INSULATING MATERIAL

Application filed November 8, 1926. Serial No. 146,929.

The present invention comprises a new laminated product which is of particular utility for electrical insulating purposes.

For some purposes, electrical insulating material should possess flexibility which is retained even when subjected to relatively high temperatures during the operation of the devices in which the insulation is employed. For example, for the insulation of some forms of electrical windings it is desirable to employ a tape consisting of strips of paper between which are held flakes of mica, the composite parts being held together by a soft, flexible binder. Heretofore, an asphaltic composition has been used as a binder, but it has been found that after the tape has been subjected to the moderately elevated temperatures at which electrical machinery is operated, say a temperature of about 90 to 125° C., the asphaltic binder tape becomes brittle and loses its mechanical strength. Many attempts have been made to find a better binder for the purpose than an asphaltic composition, but without success. No binder could be found which combined with flexibility other desired properties, such as high dielectric strength, imperviousness to moisture and oil, and which did not heat up and cause relatively high power loss in an alternating electric field.

I have discovered that an improved flexible insulation, and in particular a flexible laminated product, may be prepared by utilizing a drying oil which has been heated for sufficient length of time at a sufficient temperature to carry the oil through the gel stage to the condition of a thick liquid. This material will be referred to hereinafter by the term "degelled oil." I have found that a laminated product, such as mica tape, having its component parts joined together by degelled oil not only remains flexible for long periods of time, but has the combination of electrical and physical properties desired for electrical insulation.

An article embodying my invention is illustrated in the accompanying drawing, Fig. 1 showing in perspective a laminated insulating sheet material, one layer being cut away, and Fig. 2 being an enlarged diagrammatic cross sectional view of a fragment of such insulation.

In carrying out my invention a drying oil, such as linseed oil, perilla oil or a china wood oil, or a semi-drying oil such as castor oil, is heated in the usual well-understood manner to produce conversion of the oil to a semi-solid condition which is sometimes referred to as the gel state. The heating time is continued at a temperature which varies somewhat with the particular oil, but in general approximates 200° C., until the gel is reconverted to the liquid state. Linseed oil when thus degelled has a consistency of a thick molasses when cooled to room temperature. China wood oil is more easily degelled when mixed with a small amount, say about 1%, of an oil which is readily degelled, as, for example, linseed oil. The degelled oil also may be used in conjunction with natural gums, or condensation products, such as copal and cumar, for example.

I prefer to first impregnate a paper support for the mica with a degelled oil, preferably degelled linseed oil. This oil may be applied to the paper in solution. Various solvents may be used, for example, 55° naphtha may be mentioned as a satisfactory solvent. A suitable paper, such as rice paper, may be drawn through the solution of one part by weight degelled oil and three parts solvent, thereby impregnating the paper. The impregnated paper is baked at 140° C. for about one to two hours. Paper indicated at 1 in the drawing is coated with a layer of degelled oil applied without a solvent, for example, by painting the oil on the surface of the paper. For the latter purpose, I prefer to use degelled china wood oil. One or more layers 2 of mica flakes or splittings are applied upon the coated paper, preferably while the degelled oil is kept in a fluid state by passing the material over a heated surface. In Fig. 2, the mica layers are indicated for the sake of simplicity as a single unbroken layer 2. Degelled oil is applied on the upper surface of the mica splittings, and finally a layer of paper 3, which has been impregnated as above described with a solution of degelled linseed oil, is superimposed

upon the coating of mica flakes. The component parts preferably are pressed together by rollers to thoroughly consolidate the different layers. The degelled oil is sufficiently adhesive to prevent undue slipping of the component parts of the laminated material thus produced. The rollers either may be heated or a roller may be applied to the material while on the hot plate.

The product thus made preferably is baked at about 140° C. for about one hour to render the oil somewhat rubbery, a state which I may term as cured degelled oil.

Tests have shown that at about 100° C. electric power losses in insulation made in accordance with my invention are about one-fourth as great as, or even less than, in a similar product made with an asphaltic binder.

What I claim as new, and desire to secure by Letters Patent of the United States, is:

1. An electrical insulation comprising laminations of flexible insulating material cemented with a degelled, drying oil.

2. A laminated product comprising mica flakes having the component parts thereof joined together by cured, degelled, drying-oil.

3. An insulating material comprising a support of flexible material and one or more layers of mica flakes cemented thereto by a degelled oil.

4. Insulating tape comprising strips of paper impregnated with degelled oil and flakes of mica interposed therebetween and held in place by films of cured, degelled oil.

In witness whereof, I have hereunto set my hand this 5th day of November, 1926.

LESTER V. ADAMS.