

UNITED STATES PATENT OFFICE.

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METHOD OF WORKING UPON SURFACES OF EBONITE ARTICLES.

No Drawing.

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My invention relates to methods of working upon surfaces of articles of ebonite or equivalent material, and particularly to methods for producing patterns or figures upon surfaces of said articles.

An object of my invention is to obtain ebonite articles the surfaces of which are positively kept of deep black colour without any of the appreciable fading which is usual for ordinary ebonite articles.

Another object of my invention is to obtain ebonite articles having surfaces on which any desired patterns or figures are formed with substantially permanent durability both in shapes and colours.

A further object of my invention is to provide a method for producing patterns or figures on surfaces of articles of ebonite or equivalent material, simple in operation and positive in effect.

A still further object of my invention is to provide a method for converting the skin-portion of ebonite articles into another substance which is different from ebonite both in quality and nature.

As to articles made of ebonite, such as for fountain-pen barrels or casings, or electrical insulators, it has long been complained that the surface or skin portions can not be durable against the external air which causes colour fading and insulation defects, and patterns or figures formed thereon have a tendency of gradual disappearance, not by reason of wearing.

As is well known, ebonite is a substance produced by mixing and grinding together rubber and sulphur, and heating the same. It has a tendency of absorbing moisture in the external air, and consequently its electrical insulating power is gradually depreciated. Moreover, the humidity absorbed in skin portions of ebonite articles effloresce the latter by aid of external light or heat, and thereby the proper deep black colour of ebonite gradually fades in a relatively short course of time, resulting in a brownish black.

According to my experiments, it has been found impossible to get rid of such numerous undesirable effects of the air, unless the ebonite proper is protected by a substantial and strong covering of permanent tightness from the encroaching of moisture in the air. On the other hand, for putting patterns or

figures on ebonite surfaces, it is the well known art to apply moulds on the surface, before the ebonite has become rigid and the desired patterns or figures are impressed thereon. After it has been cooled, the impressed patterns or figures are kept in shape under a certain degree of mechanical stress. It will be then a natural result that the impressed portion of ebonite has a tendency to recover its initial shape or form and this tendency is present on every occasion when the ebonite articles are subjected to some degree of heating, even by the heat of the human hand grasping it, or by absorption of sun lights. The patterns or figures then gradually disappear automatically and not by reason of wearing.

According to my invention, I convert skin portions of ebonite into another substance different from ebonite proper both in nature and composition, which substance is known as "laccanite". The laccanite is substantial, strong and hard in nature, and extremely durable against efflorescence.

Many attempts have already been made to cover ebonite surfaces with another material, but partly due to the covering material selected and partly due to improper method of applying the same, such as by mere painting, none of them has shown any successful result.

According to my invention, I use a varnish which was formerly peculiar to Japan and known as "japan lacquer."

The varnish or japan lacquer is made from the juice of a tree known in Japan as the "urushi tree". Its composition is not quite definite but varies according to the soil and climate, as well as method of cultivation and other conditions.

Analytical examination of three typical examples give the following results:—

	Sample I	Sample II	Sample III
Water.....	10.94	17.81	25.46
Urushiol (urushic or jpanic acid).....	34.53	77.63	65.43
Gummic substances.....	3.25	2.62	6.95
Nitrogenous substances.....	1.28	1.94	1.55
Oil.....			0.52

Urushiol or jpanic acid is an inorganic acid proper to japan lacquer and contains tannic acid.

An ebonite article to be worked on is,

whilst in a cold condition, rotated about its axis, or reciprocated in a plane, at a considerable high speed. These movements may be effected by any suitable means. To the moving surface of the ebonite article there is applied a piece of felt having the varnish or japan lacquer adhered thereto, and which felt is applied to the article with a certain amount of pressure. As the movement proceeds the varnish is gradually forced into the surface portion of ebonite, or in other words, the surface portion is impregnated with the varnish. The impregnation is facilitated by the heat generated by friction of the felt.

By the above process, the surface portion of the ebonite is converted into a substance which is substantial, strong and hard in nature and non-hygroscopic and durable against the air.

It is assumed that during such treatment, free sulphur contained in the rubber and an acid proper to the varnish, forms a kind of sulphide called "laccanite" which has the nature above disclosed. It is not, however, my intention to place any limitation on my invention by way of the above theory.

For the sake of convenience, the above process or treatment is referred to as the "laccanite process" in the present description.

To facilitate the laccanite process, there may be initially mixed with the ebonite material a small amount of ferrous sulphide and japan lacquer. With this modification, the ferrous sulphide, together with tannic acid contained by the jpanic acid in the japan lacquer, results in a skin part of a deep black colour, and on the other hand the japan lacquer within the ebonite combines with the japan lacquer applied thereto through the laccanite process, resulting in a strong and hard covering on the ebonite proper.

For finishing additional coats of the varnish on the skin may be applied. The painted japan lacquer firmly combines with the free japan lacquer within the laccanite skin and constitutes a second layer of covering.

For articles, on the surfaces of which patterns or figures are to be produced, the above process can not be directly applied. In this case, the ebonite article to be worked on is first prepared through the usual process or patterning, that is to say its surface is marked with a pattern or figure which is a negative of the desired pattern, by means of a pressing mould before it has been cooled. The article is then cooled and subjected to the laccanite process as previously disclosed.

By this treatment the article, having a negative pattern or figure on its surface, is covered by a continuous or plane layer of

laccanite as the surface portion is uniformly subjected to the laccanite process, irrespective of the concave and convex portions of the negative pattern. In other words, the concave parts of the pattern are filled up by laccanite and the convex parts are covered by a thinner layer of laccanite than for the formers. The article is then dried up and finished. After the finishing the article is subjected to heating at a temperature of about 70° C. to 80° C., for example by means of hot water or air. Upon heating the impressed pattern or figure, or in other words the concave portion of the surface of ebonite proper reappears by reason of the mechanical stress initiated by the pressing and consequently the finished plane surface or the layer of laccanite projects at the parts corresponding to the said concave portions, thus producing upon the surface the desired pattern or figure.

The resulting pattern or figure is formed by the laccanite only which covers the ebonite proper, and consequently is strong and hard, durable against any humidity and heating, and has not the tendency to gradually disappear, as in ordinary ebonite, except by wear.

Though I have described my invention in respect of ebonite, it will readily be understood by those skilled in the art that my invention is not restricted to ebonite only but to be applicable with similar results on any other substance of like nature such as insulating compound or other vulcanized rubber compositions, or phenol condensation products.

Having now particularly described and ascertained the nature of my invention and in what manner the same is to be performed, I declare that what I claim is:

1. In a method for patterning or figuring on the surface of ebonite or like substance, comprising producing a negative pattern or figure on the surface of said substance by pressing at its soft condition, cooling the same to rigidity, forcing japan lacquer into the skin portion thereof until to get a substantially continuous surface, subjecting the same to a heating, and then cooling the same.

2. In a method for converting the skin portion of ebonite or like substance into quite a different substance, comprising initially adding an amount of ferrous sulphide and japan lacquer to said substance before vulcanization thereof, cooling the same to rigidity, and forcing japan lacquer into the skin portion thereof.

3. In a method for patterning on the surface of an ebonite rod, consisting of producing a negative pattern on the surface of said rod by pressing at its soft condition, cooling the same to rigidity, subjecting it to a rotating movement about its longitudinal

axis, applying under pressure a felt piece having an amount of japan lacquer adhered thereto upon the surface of said rod, finishing the surface, subjecting the rod to a heating at a temperature of 70° C. to 80° C., and then cooling the same.

4. In a method of working upon the sur-

face of ebonite or like substance, consisting in forcing japan lacquer into the skin portion of said substance.

In testimony whereof I affix my signature.

RYOSUKE NAMIKI.